FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

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"FLIGHT" PHOTOGRAPHS

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For Sizes and Prices, see Advert. on page iii.

DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1928

- **July 20-21** **King's Cup Race and Siddeley Trophy Tour, Hendon and (finish) Brooklands**
- **July 20-22** **Light Plane Meeting at Rotterdam**
- **July —** **Aerial Derby**
- **Aug. 4** **Close of** *Philadelphia Bulletin* **Atlantic Flight Prize**
- **Aug. 6** **Air League Challenge Cup, Norwich**
- **Aug. 27-31** **U.S. National Baby 'Plane Meeting, Milwaukee**
- **Oct. 7-28** **International Aircraft Exhibition, Berlin**
- **Oct. 8** **Aero Golfing Soc.—Team Match v. Stage G.C.**
- **Oct. 24** **Aero Golfing Soc.—"Cellon" Challenge Cup**

1929

- **Oct. 31** **Guggenheim Safe-Aircraft Competition Closes**

EDITORIAL COMMENT

IT cannot be said that the Note by the Secretary of State for Air on the principal provisions agreed to be embodied in the new contract with Imperial Airways, Ltd., for a weekly service between England and India, combined with daily services on certain routes in Europe, is really explicit. True, it gives the actual details of the maximum amounts to be paid out in subsidies each year for the new period of ten years contemplated, but it leaves out many details about which one would very much like full information before being convinced that the new basis is really likely to bring us any nearer than did the old one to the day when, as Mr. Churchill has expressed it, civil aviation can "fly by itself."

Subsidies

As far as can be gathered from Sir Samuel Hoare's Note, the text of which is published on the next page, the main point in the new agreement is to be the extension of the subsidy period to a total of fifteen years as against the ten years originally intended as the limit. That is to say, commencing on April 1st, 1929, the subsidy is to run for a period of ten years, whereas under the original agreement it would have terminated in five years from that date.

Another point to note is that the *amount* of the subsidy has been greatly increased. Under the original agreement a total of £1,000,000 was to be paid in subsidies, the sliding scale being arranged as follows: Each of the first four years £137,000; fifth year £112,000; sixth year, £100,000; seventh year, £86,000; eighth year, £70,000; ninth year, £52,000; tenth and last year, £32,000. It was not very long before it became evident that the original basis was not an unqualified success, and a few years ago a change was made, mainly in the subsidy-earning basis, which was changed from one of plain mileage to one of "horse-power-miles." That appears to be retained in the proposed new agreement, at least for the European services, on which, the Secretary of State for Air states, a minimum of 425,000,000 horse-power miles must be flown per annum.

Returning to the subject of the amount of the subsidies, the total contemplated for the next ten-year period amounts to very nearly two-and-a-half million sterling (£2,490,000). To this amount should, of course, be added the sums which Imperial Airways, Limited, have already received. Exactly what these amount to we do not know, but it must be a fairly substantial sum.

Sir Samuel Hoare's Note states that "the maximum amount for each year will be allocated in definite proportions to (1) the European services, (2) the England-Egypt section, and (3) the Egypt-India section." But what the definite proportion is the Note does not say. Before one can form any idea of the usefulness which the new agreement is likely to have, it is rather essential to know these proportions. Reading between the lines, one receives the impression that the European services are not to receive a very large proportion.

Curiously enough, just as we had obtained a copy of Sir Samuel Hoare's Note on the subsidies we received from a reader in India, a cutting from the Calcutta newspaper, *The Statesman*, the leading article in the June 22 number of which criticises the Air Ministry and states there is insufficient *liaison* between the Air Ministry and India. The article claims that the Air Ministry shows an undesirable tendency to make and publish its own plans regarding civil aviation, and then expects others to conform to them. Especially does *The Statesman* complain of the purchase of the Short "Calcutta" flying-boats, which it is assumed are intended for the Calcutta-Rangoon service. "Quite apart from the fact," the paper says, "that Imperial Airways can hardly expect the mail contract, we understand that the Director of Civil Aviation in India has on the ground of expense decided that a flying-boat service is impracticable, and that the service for which tenders will be called, and which by the way is to have precedence in time over a Karachi-Delhi or Karachi-Calcutta service, will be one of overland aeroplanes. It seems almost gratuitously fortunate that Imperial Airways have the Southampton-Jersey route available on which to employ the Short-Calcutta boat." On this point at least the Note throws some light by stating that "provision will be made for payment by Imperial Airways for these boats and a corresponding addition to the subsidy for the first year of operation of the England-Egypt section of the through route." That presumably means that the "Calcuttas" are to be used on some section of an England-Egypt route. As *The Statesman* quite rightly points out, the transportation of mails from Karachi to Delhi and Calcutta is the affair of the Government of India.

In his Memorandum on the Air Estimates, Sir Samuel Hoare foreshadowed a change in the subsidy basis, whereby more encouragement would be given to the adoption of new and more efficient aircraft types. The present Note dismisses this very important point with a brief statement that the new scale provides for the application of an average obsolescence rate of not less than 25 per cent. per annum, which will allow for two complete replacements of types during the currency of the new agreement.

That may mean a good deal, or it may mean nothing. We shall require to know a good deal more about the details before we are quite convinced that any serious effort will be made in the future to encourage the production of more efficient aircraft.

SUBSIDIES TO CIVIL AIR TRANSPORT SERVICES*

Note by Air Minister on New Basis

THE new agreement with Imperial Airways, Ltd., will come into force on April 1, 1929, in substitution of all existing agreements and will extend for a period of 10 years from that date.

The services to be provided will cover not only the present daily services on certain European routes to a minimum extent of 425,000,000 h.p. miles per annum, but also a weekly service each way between England and India, to commence on or about April 1, 1929. It is hoped that eventually this latter service will be operated twice weekly.

The through service to India will terminate at Karachi; but the Government of India have under consideration proposals for civil air transport services operating from Karachi eastwards which will connect with it. The maximum subsidies in respect of the services to be provided under the new agreement will be on the following decreasing scale :—

	£
For each of the first two years	335,000
For each of the next four years	310,000
For the seventh year	220,000
For the eighth year	170,000
For the ninth year	120,000
For the tenth (final) year	70,000

The maximum amount for each year will be allocated in definite proportions to (1) the European services; (2) the England-Egypt section; and (3) the Egypt-India section.

In view of the importance of securing continuous progress in the design of machines, and more particularly a steady improvement in the ratio of paying load to running costs, the scale of subsidy above mentioned provides for the application of an average obsolescence rate of not less than 25 per cent. per annum, unless in special circumstances the Secretary of State shall otherwise determine. This will allow for two complete replacements of types during the currency of the Agreement, at the expiration of which period it is hoped that, given a reasonable increase in the volume of traffic, a fully-paying type of machine, with consequent low obsolescence rate, will have been evolved and that subsidies from the Exchequer will no longer be required.

In effect, as the result of experience gained to date under the old agreements, the period of 10 years, by the end of which it was originally hoped that commercial air transport would have become self supporting, is extended to 15 years; and the new agreement accordingly provides for the subsidy in respect of the European services being maintained in 1928 at the same rate as in the past four years, and thereafter tapering towards extinction over 10, instead of 5, years.

In regard to mails, the surcharges per ounce of mail carried will be fixed in agreement with the Postmaster-General, but provision will be made in the agreement for carriage of mails at such rates as will enable the surcharge, in the first instance at any rate, to approximate to 3*d.* per ounce between England and Egypt, Egypt and Iraq, Iraq and India; and 6*d.* per ounce between England and Iraq or India.

The conditions in regard to the England-India service include the handing over to Imperial Airways, Ltd., of the two experimental "Calcutta" flying-boats recently completed under the Civil Aircraft Experimental programme; but provision will be made for payment by Imperial Airways for these boats and a corresponding addition to the subsidy for the first year of operation of the England-Egypt section.

Under the existing agreements, one-third of the profits of the company available for distribution after a dividend of 10 per cent. on the paid-up capital is to be applied to repayment of subsidies received by the company under the agreement of May 15, 1924. In the new agreement, this provision will be abandoned and, in lieu thereof, the Government will receive an allotment of deferred shares carrying rights to half the excess over 10 per cent. on the ordinary shares which (1) may be distributed as dividends in any year during the 10 years' subsidy period; (2) may be earned as distributable profits in any year thereafter. The deferred shares will also have special rights in regard to participation in any surplus assets in the event of a voluntary winding-up of the company.

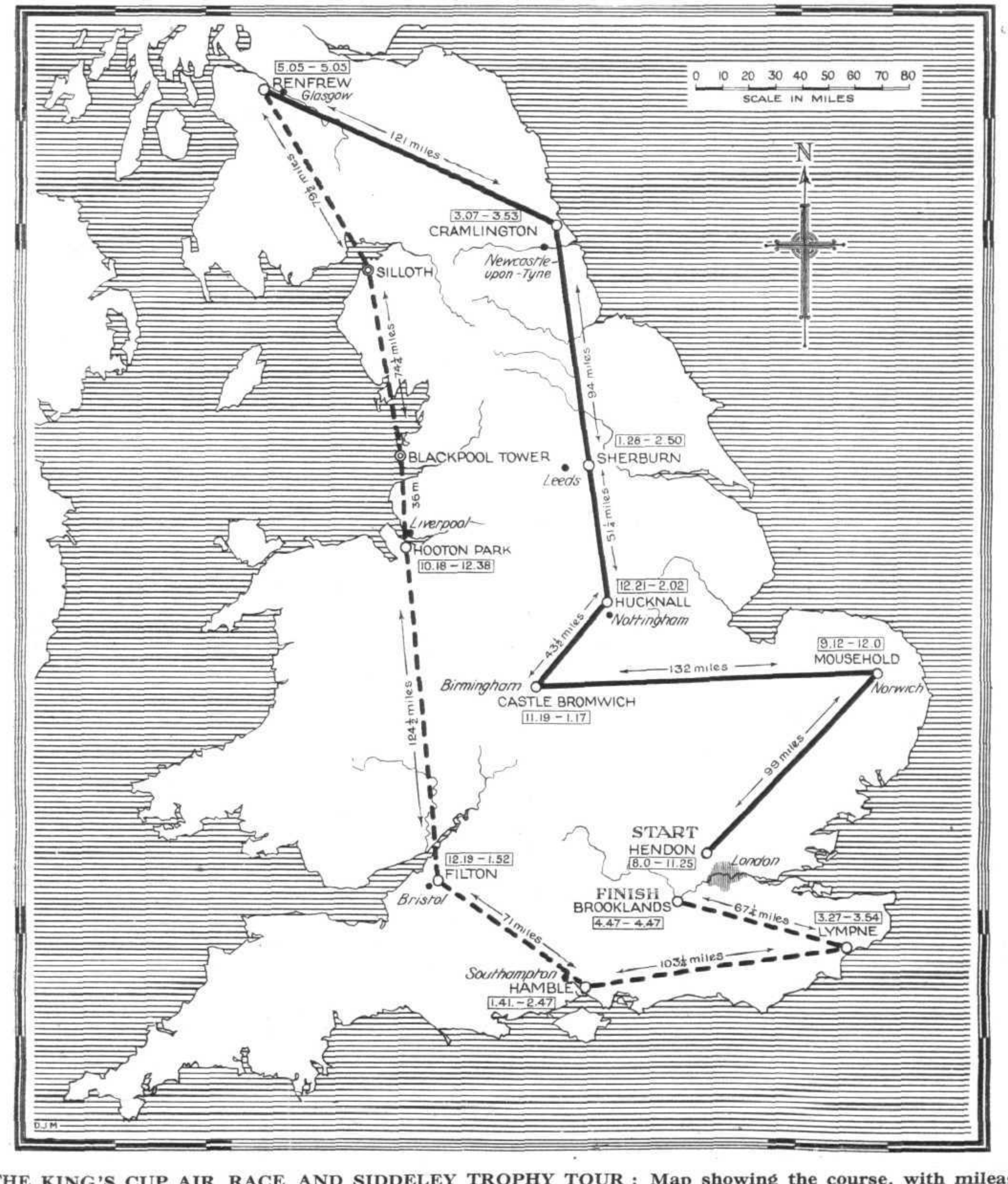
The right of the Secretary of State to nominate two Government directors upon the board of the company is retained, and apart from the special provisions above quoted, the general terms and conditions of the agreement will be similar to those embodied in the former agreements (Cmd. 2010 of 1923; 2574 of 1926; and 2758 of 1926).

* Cmd. 3143, Price 1*d.* net.

KING'S CUP RACE AND SIDDELEY TROPHY TOUR

ON Friday, July 20, the King's Cup Race and the Siddeley Trophy Tour will start simultaneously from the Hendon Aerodrome, London, at about 8 a.m. when the first machine is scheduled to get away for the 1,100 miles flight round Great Britain. Then at intervals the other machines will follow up to 11.25 a.m. when the scratch machine leaves. The points touched the first day will be Norwich, Birmingham, Nottingham, Leeds, Newcastle and Renfrew. Those who have got through will spend the night at Renfrew and resume the next morning, Saturday, July 21; the first machine leaving at 8 a.m. Passing down the west of Scotland and England they will touch at Silloth, Blackpool, Liverpool, Bristol, Southampton, Lympne and finally Brooklands, where the finish is anticipated at 4·47 p.m., coinciding with the 200-mile reliability trial of the Junior Car Club. Also, during that afternoon, the Royal Air Force will give displays. The first half of the course from London to Renfrew is 540¾ miles, the longest lap being between Norwich and Birmingham, 132 miles. The course from Renfrew to Brooklands is 555¾ miles, the longest lap being between Liverpool and Bristol, 124½ miles. Many of the pilots will be racing for the Siddeley Trophy Tour at the same time, that is to say they will be in one race for two separate purposes. Our table will show those thus competing.

The winner of His Majesty's Cup also receives £200 from Sir Charles Wakefield, whilst the second prize is £100 (£50 presented by Mr. Vernon Bellhouse and £50 by Sir Charles Wakefield). The Blackpool Tower Co. Ltd., gives the third



THE KING'S CUP AIR RACE AND SIDDELEY TROPHY TOUR: Map showing the course, with mileages between controls, which competitors in both events will follow on July 20-21. The figures in frames indicate the times at which the limit and scratch competitors respectively start from Hendon and are scheduled to arrive at the various controls and finishing point (Brooklands).

COMPETITORS IN THE KING'S CUP AIR RACE, JULY 20, 21, 1928

Racing No.	Entrant.	Machine.	Engine.	Pilot.
1	Will Hay	S.E. 5A	120 h.p. Airdisco	F. R. Matthews.
2	Lieut. L. G. Richardson, R.N.	D.H. Moth	75 h.p. Cirrus Mark II	Lieut. L. G. Richardson, R.N.
3	Air Commodore J. G. Weir, C.M.G., C.B.E.	Autogiro C.8 L.2	180 h.p. Armstrong Siddeley Lynx Mark IV	A. C. H. A. Rawson.
4	Wing-Com. C. D. Breese, A.F.C.	H.A.C. II	31 h.p. "Bristol" Cherub Mark III	Flight-Lieut. C. F. Le Poer Trench.
5	Alan S. Butler	D.H. Moth G	85 h.p. D.H. Gipsy	A. S. Butler.
6	Sir Charles Wakefield, Bart.	D.H. Moth G	85 h.p. D.H. Gipsy	Capt. H. S. Broad.
7	W. Lawrence Hope	D.H. Moth G	85 h.p. D.H. Gipsy	W. Lawrence Hope.
8	Norman Jones	D.H. Moth X	75 h.p. Cirrus Mark II	Norman Jones.
9	Flight-Lieut. F. O. Soden, D.F.C.	D.H. Moth	65 h.p. Armstrong Siddeley Genet I	Flight-Lieut. F. O. Soden, D.F.C.
10	J. Parkinson	Avro Avian IIIA	75 h.p. Cirrus Mark II	J. C. Cantrill.
11	A. C. M. Jackaman	D.H. Moth X	75 h.p. Cirrus Mark II	A. C. M. Jackaman.
12	Alan S. Butler	D.H. Moth X	75 h.p. Cirrus Mark II	Alan S. Butler.
13	Harold Brooklyn	Westland Widgeon III	80 h.p. Armstrong Siddeley Genet II	H. Brooklyn.
14	R. A. Bruce	Westland Widgeon	75 h.p. Cirrus Mark II	Colonel the Master of Sempill.
15	Major A. A. Nathan	D.H. Moth X	75 h.p. Cirrus Mark II	Wing-Com. S. W. Smith.
16	R. A. Whitehead	Baby Avro	60 h.p. Cirrus Mark I	R. A. Whitehead.
17	P. N. G. Peters	Avro Avian	75 h.p. Cirrus Mark II	Flight-Lieut. R. L. Ragg, A.F.C.
18	G. G. Parnall	Parnall Imp	80 h.p. Armstrong Siddeley Genet II	Flying Officer D. W. Bonham-Carter.
19	T. O. M. Sopwith, C.B.E.	Hawker Heron	490 h.p. "Bristol" Jupiter VI	Flt.-Lt. P. W. S. Bulman, M.C., A.F.C.
20	H. J. Thomas	"Bristol" 83E	210 h.p. "Bristol" Titan Mark I	Sqd.-Ldr. A. G. Jones-Williams.
21	Sir George Stanley White, Bart.	"Bristol" 101	490 h.p. "Bristol" Jupiter Mark VIA	C. F. Uwins.
22	H. J. V. Ashworth	Avro Avian	75 h.p. Cirrus Mark II	Bernard Martin.
23	The Right Hon. Sir William Joynson-Hicks, L.D., M.P.	Gloster Grebe	385 h.p. Armstrong Siddeley "Jaguar"	Flying Officer R. L. R. Atcherley.
24	G. N. Warwick	Anec IV	80 h.p. Armstrong Siddeley Genet II	G. N. Warwick.
25	M. A. Lacayo	D. H. Moth	60 h.p. Cirrus Mark I	M. A. Lacayo.
26	Robert Blackburn	Blackburn Lincock	180 h.p. Armstrong Siddeley Lynx IV	Sqd.-Ldr. J. Noakes, A.F.C., M.M.
27	O. E. Simmonds	Simmonds Spartan	75 h.p. Cirrus Mark II	Flight-Lieut. S. N. Webster, A.F.C.
28	R. L. Preston	Blackburn "Bluebird"	80 h.p. Armstrong-Siddeley Genet II	Flying Officer L. S. Birt
29	R. G. Cazalet	Westland Widgeon III	75 h.p. Cirrus Mark II	R. G. Cazalet
30	H. M. Yeatman	D.H. Moth	60 h.p. Cirrus Mark I	H. M. Yeatman
31	W. Newton	Avro Avian IIIA	80 h.p. Armstrong-Siddeley Genet II	G. E. F. Boyes
32	A. V. Roe	Avro Avenger	550 h.p. Napier Lion Mark IX	Flight-Lieut. F. L. Luxmoore, D.F.C.
33	Lady Wakefield	Avro Avian	85 h.p. Cirrus Mark III	Capt. E. W. Percival
34	A. V. Roe	Avro Avian	75 h.p. Cirrus Mark II	Flying Officer C. B. Wilson
35	Lieut.-Col. M. O. Darby, O.B.E.	D.H. Moth	85 h.p. Cirrus Mark III	Flg- Officer T. Neville Stack, A.F.C.
36	Lt.-Col. John Barrett-Lennard, C.B.E.	A.D.C. Nimbus-Martinsyde	300 h.p. A.D.C. Nimbus	Sqd.-Ldr. H. W. G. Jones, M.C.
37	Miss W. E. Spooner	D.H. Moth	60 h.p. Cirrus Mark I	Miss W. E. Spooner
38	Capt. C. B. Wilson, M.C.	D.H. Moth	60 h.p. Cirrus Mark I	E. E. Stammers

COMPETITORS IN THE SIDDELEY TROPHY TOUR

Racing No.	Entrant and Pilot.	Machine.	Engine.
2	Lieut. L. G. Richardson, R.N. (London Aeroplane Club).	D.H. Moth	75 h.p. Cirrus Mark II.
4	Flight-Lieut. C. F. Le Poer Trench (Halton Aero Club)	H.A.C. II	31 h.p. "Bristol" Cherub Mark III.
5	A. S. Butler (Bristol and Wessex Aeroplane Club)	D.H. Moth G	85 h.p. D.H. Gipsy.
8	Norman Jones (London Aeroplane Club)	D.H. Moth X	75 h.p. Cirrus Mark II.
9	Flight-Lieut. F. O. Soden, D.F.C. (London Aeroplane Club)	D.H. Moth	65 h.p. Siddeley Genet I.
11	A. C. M. Jackaman (London Aeroplane Club)	D.H. Moth X	75 h.p. Cirrus Mark II.
13	Harold Brooklyn (Halton Aero Club)	Westland Widgeon III	80 h.p. Armstrong-Siddeley Genet II.
16	R. A. Whitehead (Southern Aeroplane Club)	Baby Avro	60 h.p. Cirrus Mark I.
17	Flight-Lieut. R. L. Ragg, A.F.C. (Royal Aircraft Establishment Aero Club)	Avro "Avian"	75 h.p. Cirrus Mark II.
28	Flying Officer L. S. Birt (Suffolk and Eastern Counties Aeroplane Club)	Blackburn "Bluebird"	80 h.p. Armstrong-Siddeley Genet II.
29	R. G. Cazalet (Midland Aero Club)	Westland Widgeon III	75 h.p. Cirrus Mark II.
30	H. M. Yeatman (Hampshire Aeroplane Club)	D.H. Moth	60 h.p. Cirrus Mark I.
37	Miss W. E. Spooner (London Aeroplane Club)	D.H. Moth	60 h.p. Cirrus Mark I.
38	E. E. Stammers (London Aeroplane Club)	D.H. Moth	60 h.p. Cirrus Mark I.

prize of £50 and there is a special prize of £100 by Mr. Alan S. Butler to the entrant of the machine which completes the course in the fastest time.

The following prizes have also been promised :—Glasgow Corporation, value £40 ; *Glasgow Herald*, value £40 ; *Folkestone Herald* (Cup) value £10 ; and *Eastern Daily Press*, Norwich, £5 5*s*.

The prizes presented by Mr. J. D. Siddeley are the Challenge Cup and £150 ; second, £75 ; and third, £25.

There are 38 entrants, incidentally representing the Royal Air Force, the Aircraft Industry, the Flying Clubs and Private Owners. The Home Secretary, Sir W. Joynson-Hicks has entered a Gloster "Grebe" which Flying Officer R. L. Atcherley will fly. No doubt one of his difficulties will be remembering that there is no time to fly upside down and complete outside loops. The "Autojyro" with the Armstrong-Siddeley "Lynx" engine is bound to be watched closely for this will not only be its debut in the King's Cup race, but its first attempt at long distance flying—at least in public.

If the Parnall "Imp" has recovered from its affair with the D.H. "Moth" at Blackpool it will mean that all the modern light aeroplanes will be competing, most of the types being duplicated. The appearance of the latest model, the Simmonds "Spartan" (Cirrus) will be interesting particularly as it is in the hands of Flt.-Lt. S. N. Webster, who will no doubt have a big following amongst the public. He did 200 m.p.h. at the recent Blackpool meeting on the Avro "Avenger," but Flt.-Lt. Luxmoore will be flying that machine in the King's Cup. Mr. Robert Blackburn is trying his new machine the Blackburn "Lincock," a single-seater fighter with a 180-h.p. Lynx, piloted by Sqdr.-Ldr. J. Noakes. The lowest powered machine will be the little Halton monoplane with its Bristol "Cherub," of 31 h.p. and the highest powered the "Avenger" with its Napier "Lion" of 550 h.p.

Quite a few of the many D.H. "Moths" entered will be powered with the new D.H. "Gipsy" engine of 85 h.p. Amongst the private owners there will be Mr. Cazalet and Mr. "Harold Brooklyn" on their own Westland "Widgeons" Mr. G. N. Warwick, on his "A.N.E.C." IV with "Genet" 80 h.p. engine ; Mr. H. M. Yeatman, Miss W. E. Spooner, Mr. Norman Jones, Lieut. L. G. Richardson, Flt.-Lt. Soden, Mr. A. C. M. Jackaman and Mr. A. S. Butler all on their own D.H. "Moths." Miss Spooner will alone represent her sex. Mr. Will Hay has put his S.E.5A in to be flown by Mr. F. R. Matthews and a new private owner, Mr. Ashworth, will have his club instructor, Mr. B. Martin, flying his Avro "Avian." Capt. H. Broad will fly for Sir Charles Wakefield on a Gipsy-Moth and Capt. L. Hope, last year's winner, will be on a similar machine.

As the machines are due to stop for half an hour at Sherburn aerodrome Yorkshire, the Yorkshire Club has arranged for visitors to see them. They will be charged sixpence per person and sixpence per car. The arrivals are expected from noon onwards—on the Friday, of course. Members will be admitted free on producing their membership cards. Volunteers are required for duty as marshals.

Avro "Avians" in Australia

It is pointed out to us that Wings, Ltd., are the representatives in South Australia and the Western half of New South Wales for the Avro "Avians," and that of four machines which landed in Australia a few months ago two were imported by Wings, Ltd.

Capt. Sparks

At the recent Blackpool air meeting a subscription was raised amongst the racing pilots for the purpose of sending a cigarette box as a small memento to Capt. Sparks, the old London Aeroplane Club instructor, who went to Canada a few months ago to take up a similar position.

(*Continued from page* 600)

LIGHT AIRCRAFT AT THE SHOW

IN view of the growing popularity of private flying, and the light aeroplane, the number of machines of this type is rather disappointing. Of school machines and similar medium-powered craft, there are many, but the number of machines which come under the classification of light aeroplanes is small. The Germans exhibit the little Klemm-Daimler, which is, of course, an ultra light type. In the gallery, L. Peyret shows a tandem monoplane with Sargant engine, and Albert his little monoplane (without engine) from the Orly competition, while a newcomer is Bourgois, with a parasol monoplane with " Y " type Anzani engine. In the Grand Nef one finds, in addition to the Klemm-Daimler, the Caudron C. 109 parasol monoplane with Salmson engine, which has many fine flights to its credit, and is already well known. Then there is the Mureaux M.B 35, which is really a submarine scout, but could be used very well as a private owner's machine. Finally, the Liore and Olivier flying boat LeO H.18, which with a Salmson 120 h.p. engine has a little more power than average British light 'planes, but which probably needs it, being a flying-boat.

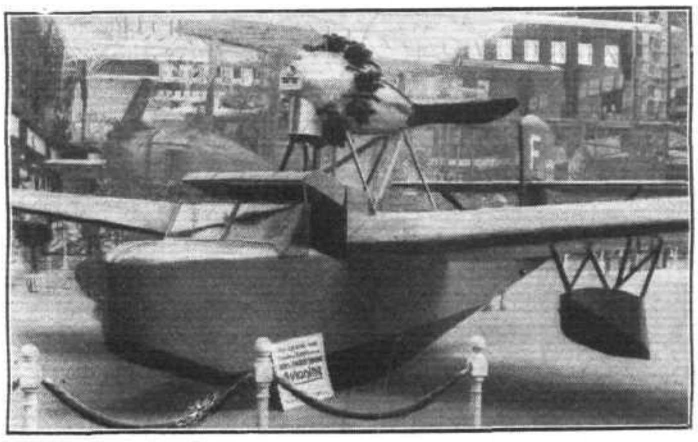
The LeO H.18

Although the square section, flat-bottomed single-step hull might not be viewed with favour in this country, the Liore and Olivier LeO H.18 is a very interesting little machine and represents a type which, in our opinion, deserves to be taken up and developed for the British private owner, who prefers to make use of the many rivers, lakes and other sheltered waters which offer good anchorages and are suitable for use as " aerodromes."

Comfort has obviously been one of the aims of the designer in producing this machine, for he has placed pilot and passenger side by side in a fairly wide compartment, ahead of the wing and in front of the engine. Moreover, he has provided them with a hinged windowed roof so that in bad weather they may be protected against the elements. In coming in to pick up moorings, the occupants can raise this roof, when they are free to wield boat hook and mooring rope. The fact that the engine is above and behind the cockpit, and drives a " pusher " airscrew, further enables the machine to be taxied along slowly when picking up moorings, leaving the crew free to manœuvre without having to stop the engine until the machine has been secured.

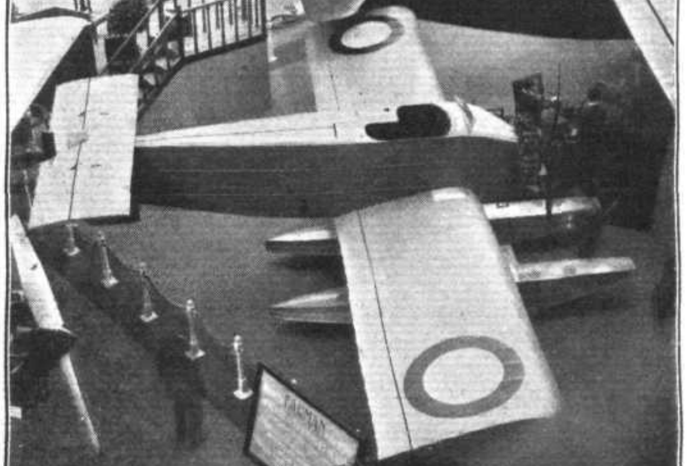
Except for cheapness, there is, of course, no reason why the hull should not be made with two steps and V-planing bottom, as in large British flying boats. Seaworthiness would scarcely be expected from so small a craft, whatever hull form is chosen, but the V-bottom is a great help in reducing the shock of alighting, even on a smooth surface.

In the LeO H.18 the hull is of all-wood construction, as is also the monoplane wing, which is covered with plywood. Lateral stability on the water is ensured by two wing floats.



[" FLIGHT " *Photograph*

A LIGHT FLYING-BOAT : The Liore and Olivier Leo 18 is one French firm's interpretation of the private owner's seaplane. With the two seats arranged side by side, conduite interieure, and a " pusher " airscrew, the machine should be clean, comfortable, and quiet.



[" FLIGHT " *Photograph*

A TWIN-FLOAT VERSION : The M.B. 35 exhibited on the Mureaux stand is primarily a submarine scout, but should also be a useful type as a private owner's machine

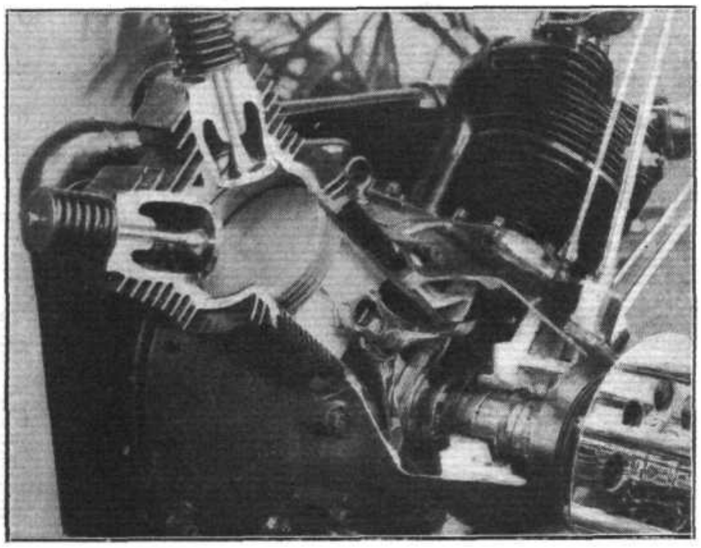
The "Avia" B.H.33 is a Single-seater Fighter with Walter "Jupiter" engine.

SERVICE TYPES AT THE SHOW

Although by far the greater proportion of machines exhibited at the Paris Show were service types, there were relatively few which were of outstanding interest, the majority being just plain straightforward aircraft of orthodox design and construction. Space will not permit of referring here to more than a very few of these.

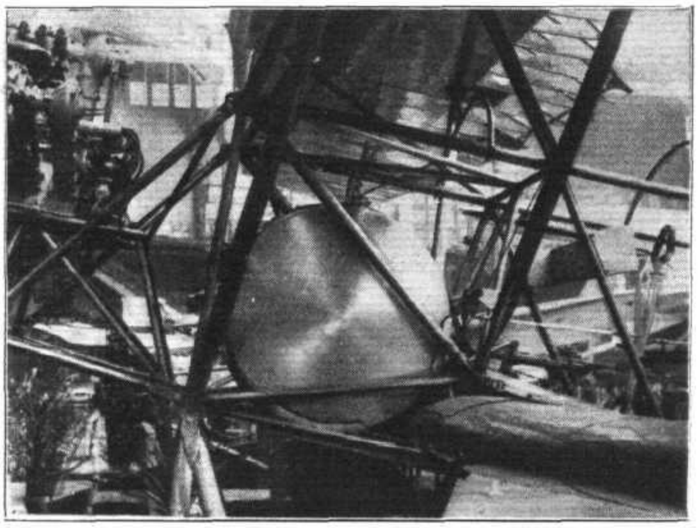
Avia B.H. 33

The Avia firm of Prague, designers and constructors of a large number of highly successful types, light 'planes as



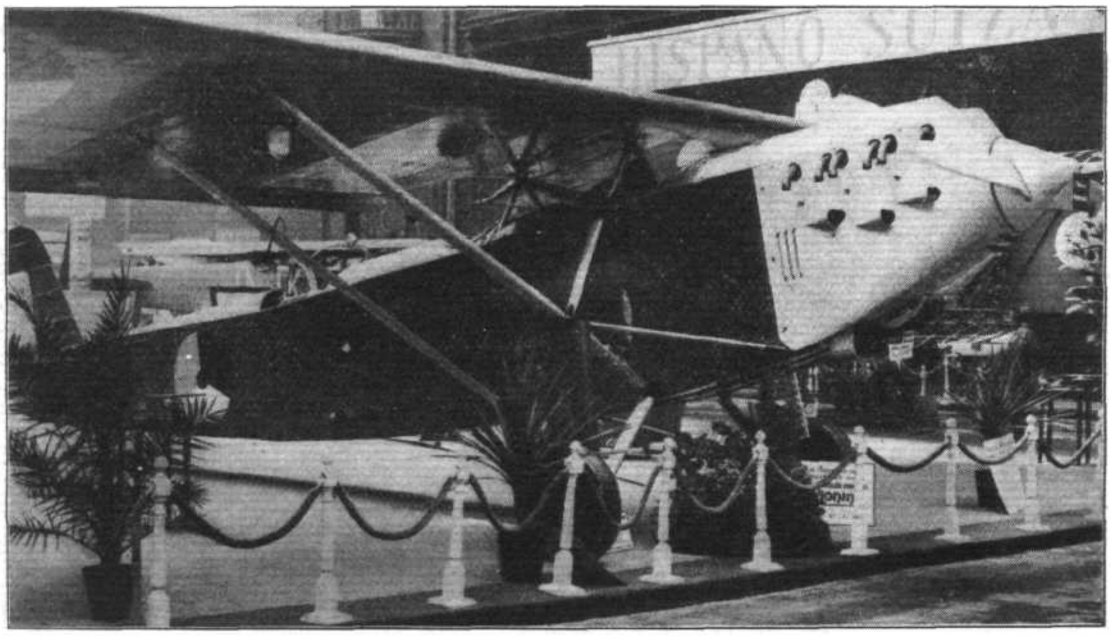
["FLIGHT" *Photograph*

The Fairchild Co. is now represented in Europe by Capt. Cyril Turner, who exhibits a Fairchild aerial camera and a sectioned Fairchild-Caminez engine.



["FLIGHT" *Photograph*

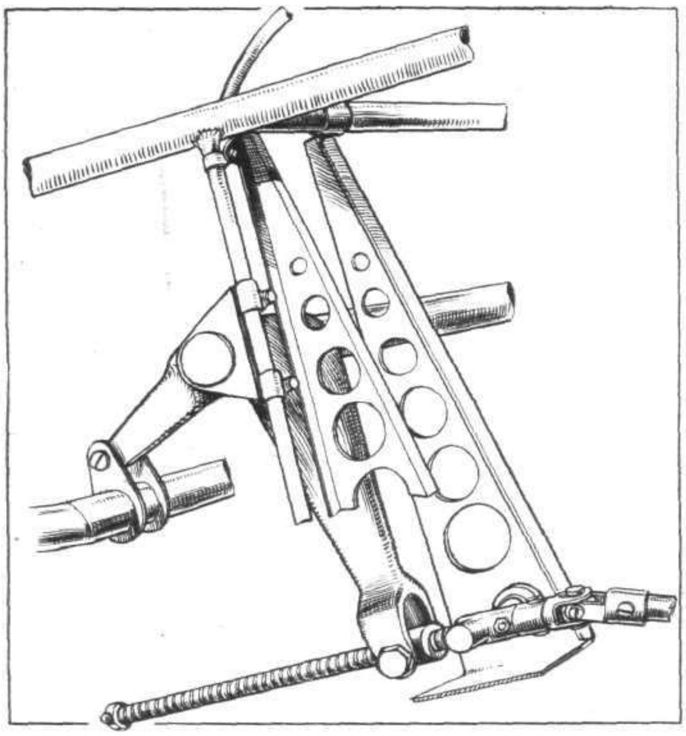
The "dropping" petrol tank of the Fokker C.V.



["FLIGHT" *Photograph*

A New Fokker Type: The C.VIII is a strut-braced parasol monoplane designed for long-distance reconnaissance.

well as service aircraft, were represented at the show by a very neat and business-looking single-seater fighter fitted with a Walter-built " Jupiter." The B.H. 33 is a slightly staggered biplane, the most unusual feature of its wing arrangement being that the top plane is of slightly shorter span than the bottom. The object of this arrangement obviously is to reduce the stresses in the top spars, the inter-



[" FLIGHT " *Sketch*

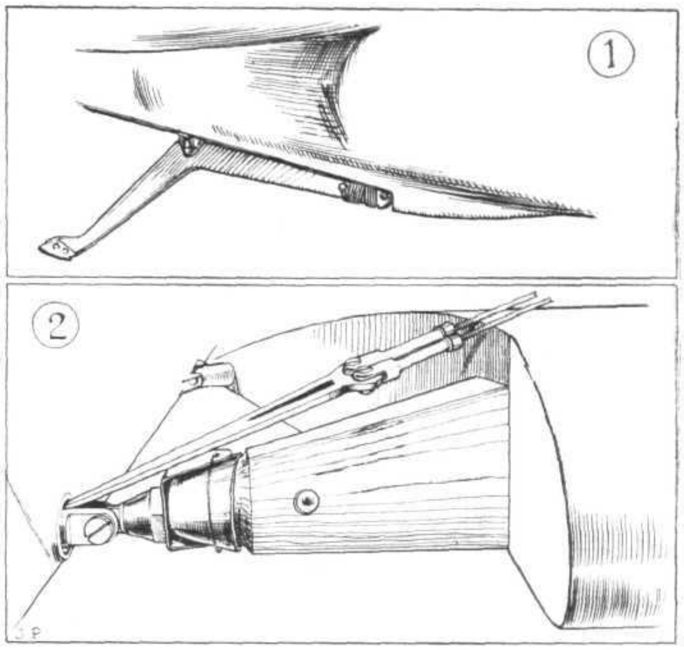
The tail-trimming gear on the Fokker C.V. The pilot rotates the worm shaft, which operates the crank arm that engages with the leading edge of the tail plane.

plane struts being sloped inward so as to reduce the free length of spar, while at the same time slightly improving the angle of the lift wires and consequently reducing the end load in the spars.

Constructionally the B.H. 33 is a simple wooden structure, in which extensive use is made of three-ply, this material forming the covering not only of the fuselage but also of a large proportion of the wings. The fuselage is flat-sided and of very simple construction, so that repairs in the field are easily and rapidly effected.

The Walter " Jupiter " engine is neatly cowled in, and with the spinner over the propeller boss gives a clean entry for the air. The engine fitted is a series VI, but if the machine is desired to be used for training in aerobatics an engine of lower power can easily be substituted.

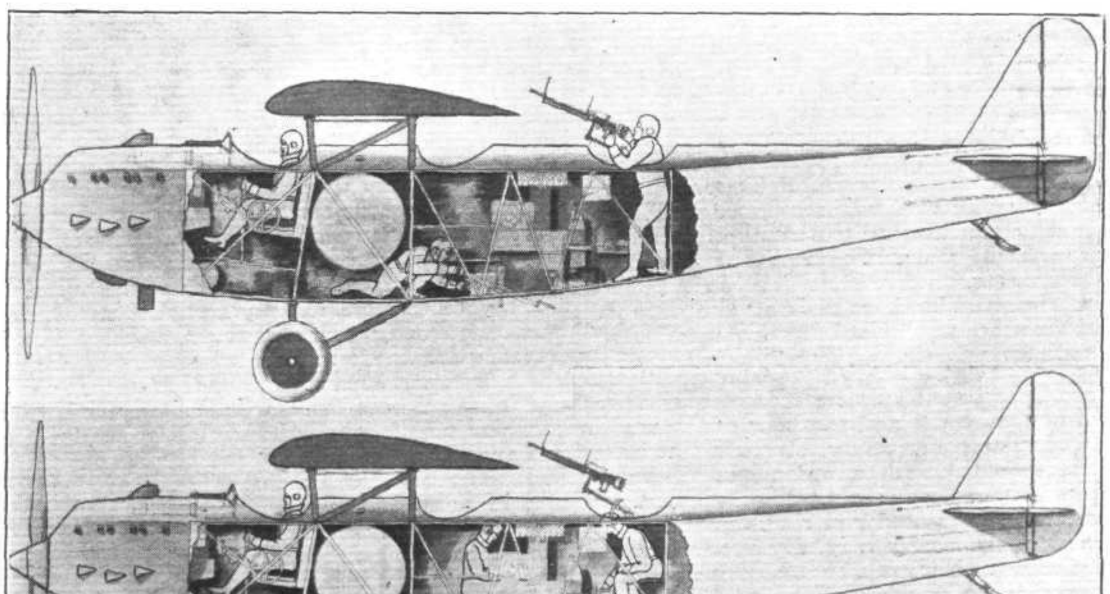
The main dimensions of the B.H. 33 are : Length o.a. 7·04 m. (23 ft. 1 in.) ; wing span 8·9 m. (29 ft. 2 in.) ; wing area 22 m.² (237 sq. ft.). The weight of the machine empty



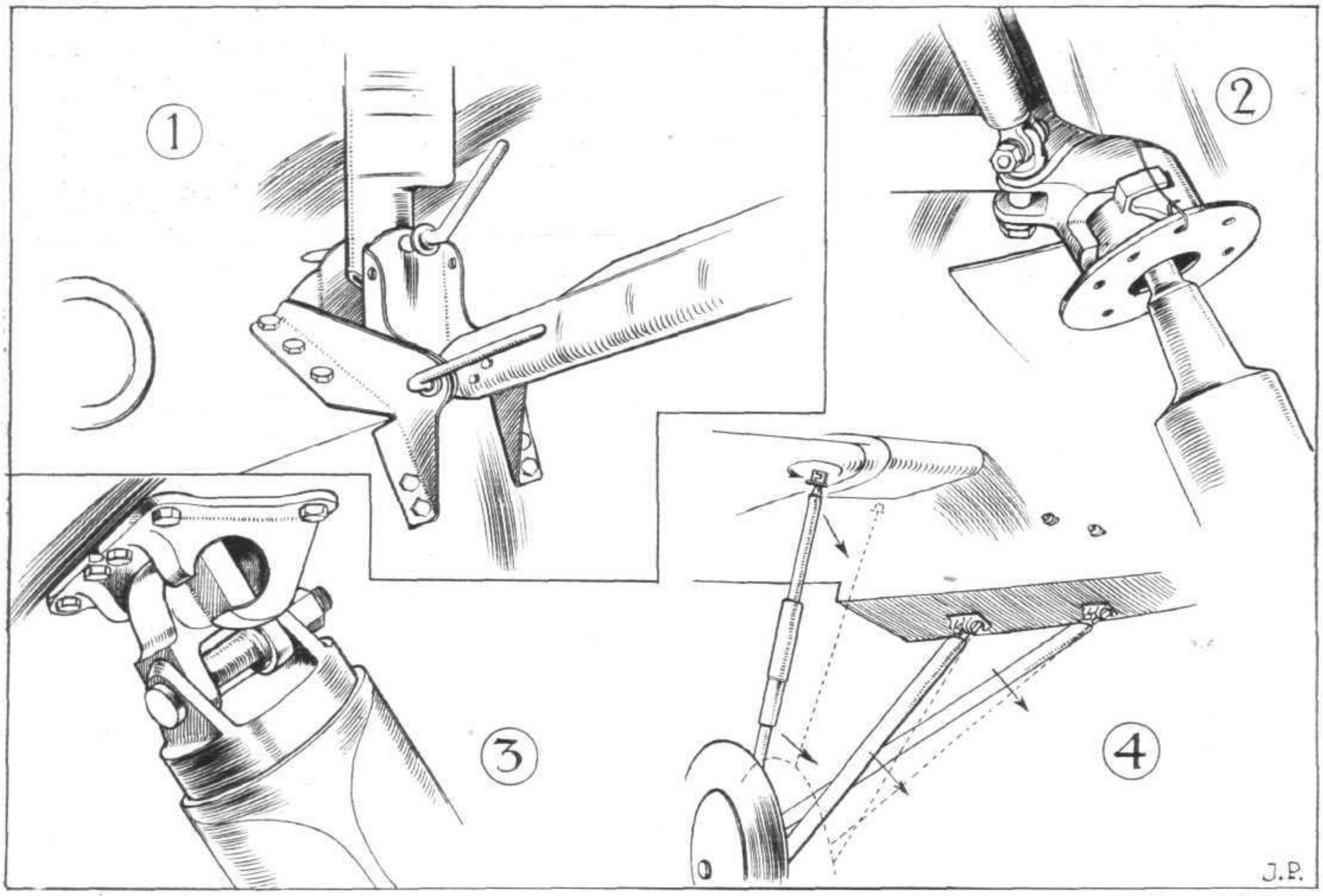
[" FLIGHT " *Sketches*

A COUPLE OF PARIS SHOW ITEMS : 1. The unusual tail skid on the Bernard Single-seater Fighter. 2. Attachment of wooden spar to fuselage on Albatros " ASS "

is 830 kg. (1,825 lb.) ; fuel 230 kg. (506 lb.) ; useful load, 190 kg. (418 lb.) ; total loaded weight, 1,250 kg. (2,740 lb.). Maximum speed at ground level, 275 km./h. (171 m.p.h.) ; speed at 5,000 m. (16,400 ft.), 260 km./h. (161 m.p.h.). Landing speed, 80 km./h. (50 m.p.h.). Ceiling, 9,500-10,000 m. (31,100-32,800 ft.). Climb to 5,000 m. (16,400 ft.) in 7 mins. 50 secs. ; climb to 8,000 m. (26,300 ft.) in 25 mins. Range, 600 km. (372 miles).



Interior arrangement of the Fokker C.VIII : The lower view shows position of crew while working, and the upper, the fighting positions of the two gunners.



["FLIGHT" *Sketches*

SOME QUICK-RELEASES AT THE PARIS SHOW: 1. The type used extensively on the Mureaux M.B.35 for the attachment of wings, floats and struts. In 4 is shown one side of the "droppable" undercarriage of the P. Levasseur torpedo-plane. Details are shown in 2 and 3. The bayonet joint in the telescopic leg is released first. The wheel and strut then drop, and in doing so allow the fitting on axle and radius rod to fall out through the slot in the fork. It should be pointed out that 2 and 3 are viewed from the back, while 4 is seen from in front.

The Fokker C. VIII

Specially designed for strategic reconnaissance, the Fokker C. VIII exhibited at Paris represents rather an innovation as far as the famous Dutch constructor is concerned. Hitherto the great majority of Fokker service types have been biplanes, or at least sesquiplanes. In the C. VIII the lower wing has disappeared altogether, doubtless as a result of the special requirements which the machine has been designed to fulfil, and the parasol monoplane is strut braced, with the undercarriage telescopic legs attached to the front lift strut, which is in turn braced by other struts in such a manner as to provide perfect triangulation.

Constructionally the Fokker C. VIII follows normal Fokker practice in that the fuselage is a welded steel tube structure, covered with fabric, while the wing is an all-wood construction with plywood covering. It is in the internal arrangement that the C. VIII is particularly interesting.

Carrying a crew of three, the machine has been so designed as to reduce almost to vanishing point any "blind spots," as the sections through the fuselage will show. The pilot's cockpit is in front, just under the leading edge of the wing and behind the engine. Behind this is the fireproof petrol tank, placed with a small gap between it and the floor of the fuselage. Then comes a cockpit for a gunner, observer or wireless operator, who is provided with a prone gun position for firing downwards and under the tail. Finally the rear gunner's cockpit has a compensated gun ring, and the gunner can fire upwards through nearly a hemisphere. With all three members of the crew at their guns, the machine would be a difficult proposition to tackle. The lower illustration shows the crew at their working stations, doing telegraphy, photography, &c.

The main data relating to the Fokker C. VIII are as follows: Length o.a. 36 ft. 7 in. (11·15 m.); wing span 46 ft. 2 in. (14·03 m.) wing area, 377 sq. ft. (35 m^2). When fitted with the Hispano-Suiza 12 Lb engine, the tare weight of the machine is 3,416 lb. (1,550 kg.); the useful load, amounting to 1,874 lb. (850 kg.) is composed as follows: crew 595 lb. (270 kg.); fuel and oil 760 lb. (345 kg.); equipment, 519 lb. (235 kg.). Total loaded weight, 5,290 lb. (2,400 kg.). Wing loading, 13·9 lb./sq. ft. (68 kg./m.^{2}). Power loading, 7·9 lb./h.p. (3·6 kg./CV). Maximum power, 670 b.h.p. at 2,200 r.p.m.; cruising power, 450 b.h.p. at 1,900 r.p.m. Maximum speed (measured over square course with 6 km. sides), 142 m.p.h. (228 km./h.); cruising speed, 116 m.p.h. (187 km./h.); minimum speed, 62 m.p.h. (100 km./h.). Range at cruising speed (3·5 hrs.), 410 miles (650 km.). Climb to 1,000 m. (3,280 ft.) in 2·35 mins.; 2,000 m. (6,560 ft.) in 6·35 mins.; 3,000 m. (9,840 ft.) in 10·8 mins.; 4,000 m. (13,120 ft.) in 16·85 mins.; 5,000 m. (16,400 ft.) in 25·25 mins. Service ceiling, 5,800 m. (19,050 ft.). Absolute ceiling, 6,300 m. (20,700 ft.). These performances are guaranteed to within a margin of 3 per cent. on speed and 6 per cent. on climb, provided the engine gives the power stated above.

The P. Levasseur P.L.7T^{2}B^{2}b

This French constructor has, for many years, made a speciality of *Avions Marin* of various types, intended for work with the French fleet, and for several years one of the features of all such machines has been the boat-built fuselage capable, when the machine alights on the sea, of remaining afloat at least for a sufficient time to give the crew a chance of being rescued. The machine exhibited this year is larger and, perhaps, in a way more ambitious, than have been those shown previously, but it retains the usual P. Levasseur features.

The fuselage is built up much in the manner of a flying boat hull of very narrow beam. It should be realised that the machine is not intended to be flown off the water, but merely to be capable of alighting on it. The propeller (a Levasseur-Reid, of course) can be locked by the pilot in a horizontal position, and the undercarriage can be dropped while the machine is in flight.

The fuselage or hull is provided with two steps, and has a fairly pronounced Vee bottom. The front step has a channel

(Concluded on page 620)

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

July 19, 1928

CONTENTS

EDITORIAL VIEWS

It had been our intention to publish in the present issue of THE AIRCRAFT ENGINEER an illustrated article by Mr. Pollard on "Metal Construction at the Paris Aero Show." Unfortunately, owing to the fact that next week's issue of FLIGHT will contain a special section on tinted paper, dealing with the King's Cup Air Race and the race for the Siddeley Trophy, we have had to bring forward, by one week, the publishing date of THE AIRCRAFT ENGINEER. One result of this has been that Mr. Pollard's article did not reach us in time to be included. It is, however, to hand now, with a number of illustrations, and will be given in our August issue. We apologise to readers for the delay, which may prove a little annoying, but can assure them that it was unavoidable.

In the meantime, we are publishing in the present issue the portion of Mr. Pollard's article on "Metal Construction Development" which we were compelled to hold over last month. In it will be found a wealth of really useful information for those who have not so far had a great deal of practical experience in metal construction, and in particular, that form of metal construction which makes use of rolls and dies for the forming of "crinkled" and other sections from flat metal strip.

The present instalment of Mr. Pollard's interesting and instructive series of articles is of a particularly practical nature, dealing as it does with such problems as spring-back, the making of templates and "proofs," rolls and dies, and the importance of selecting appropriate stages in the forming process, and of keeping the length of arc constant for each curve from stage to stage.

Those not familiar with the subject might easily form the opinion that the forming of strip is a difficult and uncertain business. Mr. Pollard shows that, provided a few safeguards are taken and common sense brought to bear upon the problems, there is no need to become alarmed by the apparent difficulties.

Mr. Wm. Munro, who is associated with the Gloster Aircraft Co., deals with the subject of "Factors in Seaplane Float Design." In view of the increasing use and development of the seaplane, the problems connected with the design of floats become important, and any literature which is calculated to assist beginners is to be welcomed.

METAL CONSTRUCTION DEVELOPMENT

By H. J. POLLARD, Wh.Ex., A.F.R.Ae.S.

(*Continued from page* 47.)

Having determined the shape of the finishing tools, the selection of the different stages from the flat strip to the final tool is a matter entirely for experience; the only considerations are to produce the section with the minimum of rolls or dies, at the same time ensuring that no damage is done to the strip through endeavouring to perform too much work at any particular stage.

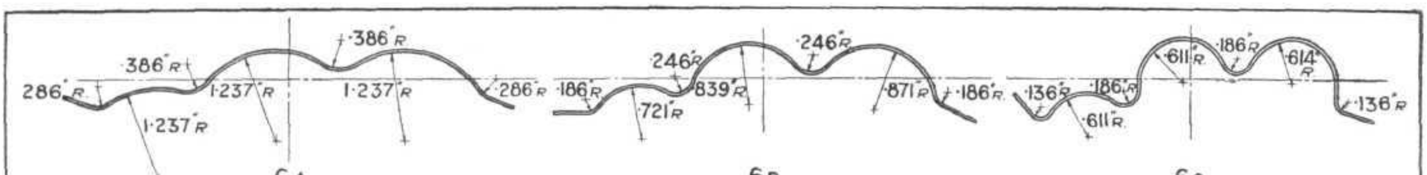
Figs. 6 A, B and C, 7 A, B, C and D, and 8 A, B, C, D and E are typical examples of progressive tool contours.

In general, it is not necessary to have different rolls for different thicknesses of strip for the same section, but the final die must, of course, be different for different thicknesses, in order to get the correct final shape. Thus, in Fig. 7, two pairs of rolls are adequate for strip ranging from 28 G to 24 G in thickness, but a different die is necessary for each gauge. When the finished shape is produced in rolls, then the final pair must be designed for each strip thickness in order to correct the spring-back, which varies inversely as the thickness.

Until the tool designer has had a fair amount of experience, it is better to over estimate the amount of spring-back which is likely to take place than underestimate it, for the operation of increasing the width of a formed section is a much simpler one than making a wide section narrow. In the use of rolls the parts of the section where most work is to be done should be as near as possible to the line midway between the axes of the rolls. The section designer should always endeavour to include one or more bends of small radius in the sections he designs, and these sharp curves should be formed as much as possible in the first pair of rolls. The groove thus formed will act as a guide for the strip through the subsequent rolls or dies. Experience has shown that it is more satisfactory to do some work on *every* part of the width of the strip at each stage and *not* to complete one arc before beginning to form another. (It does not follow that this would be the better procedure where other methods of forming are to be followed, as for instance, feeding through rolls and dies at one pass.)

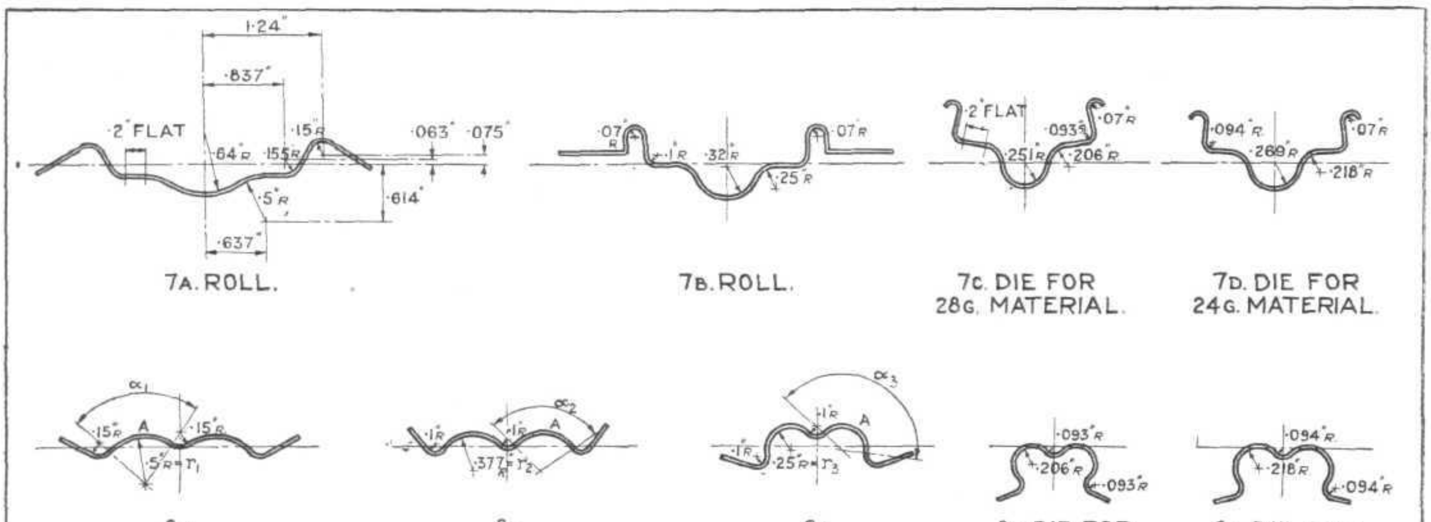
Templates need to be made with great accuracy, and trouble is invited by attempting short cuts in making them. It is essential that the templates should be fitted to a replica of a section of the required roll or die. These copies of the tool contour (usually known as "master templates" or "proofs") as well as the shop templates are usually made

from 18 G. sheet steel. Each proof and its template must be reversible in the case of symmetrical sections, otherwise special markings are needed on the rolls as to which ends are to be threaded on to the rolling mill spindles; this should not be necessary. Fitting the proofs together gives the true contour and gap, and this must agree with the calculated shape. After the rolls or dies are made to the templates and the rolls are bored, broached, etc., it is usual to try them out before hardening, and it is usually necessary to touch them up here and there where the material shows signs of being nipped: this is a matter for ordinary observation. It is always easier to form a symmetrical than an unsymmetrical section. Unsymmetrical sections are rarely required, but when they are, some ingenuity may be required from the operator because of the possibility of the strip being fed through the rolls at varying speeds across its width. Fig. 6, *a*, *b* and *c*, is a case of an unsymmetrical section.



6A. 6B. 6C.

Rolls should be made from good case-hardening steel; ordinary mild steel is often used, but a 0·1 per cent. nickel steel is better. Although a glass hard surface is not necessary, yet the harder the surface the better, since there is always a tendency for the edges of the strip to cut furrows in the sides of the rolls and in time such grooves may tend to throw the strip out of line. Owing to the large mass of metal that is sometimes necessary in a roll, it is not always easy to obtain a hard surface without some distortion after case hardening. The only operations after hardening should be polishing and grinding out the bore. Oil lubrication is, of course, an advantage in rolling and a very liberal supply of oil is an absolute necessity in drawing.



7A. ROLL. 7B. ROLL. 7C. DIE FOR 28G. MATERIAL. 7D. DIE FOR 24G. MATERIAL.

8A. 8B. 8C. 8D. DIE FOR 28G. MATERIAL. 8E. DIE FOR 24G. MATERIAL.

Die making is quite a different matter from roll making. Where only a small quantity of a section is required, ordinary cast-iron dies may be used, but the gap will be good only for a few hundred feet of strip. Indeed, for soft metals a simple wooden die can be made. For quantity production in steel it is usual to make the body of the die in cast iron, the lead-out portion being fitted with a hard steel face. Owing to the harsh nature of the drawing operation, this exit face should be glass hard, or rapid wear will take place and frequent renewal will be necessary. A sketch of a typical die is shown in Fig. 9. Special devices are frequently necessary for use with dies, such for instance as floating mandrils for forming complete curls, etc. There is usually no difficulty in fitting these to the dies. While drawing cannot compare with rolling in speed of production (except where the material is pulled through rolls) yet where an experimental section is required urgently, drawing may be resorted to in preference to rolling, as dies can be produced more quickly than rolls. For this reason also it is often more economical to make dies where only a small quantity of the section is likely to be required.

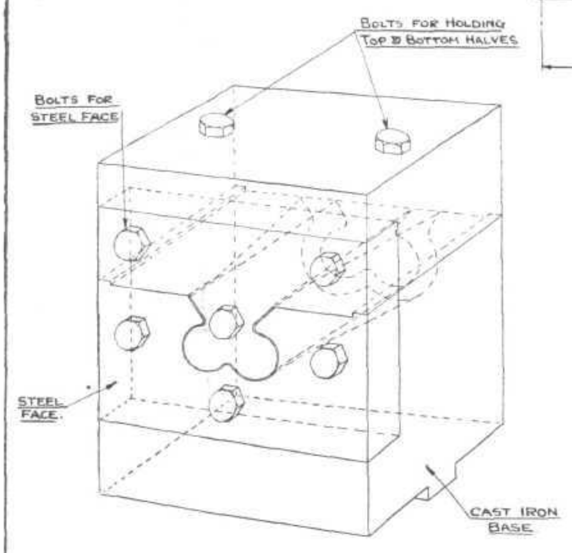
If, for instance, a figure, as shown in Fig. 10, were required urgently in a special case, tools as shown in Fig. 11A and 11B could be made.

Apart from selecting appropriate stages for the forming process, the only other consideration of first importance lies in keeping the length of arc constant for each curve from stage to stage, as in Fig. 8A, 8B, and 8C, part A $r_1 = \alpha_2$; $r_2 = \alpha_3$; etc.

Various artifices need to be introduced occasionally. For example, in members subjected to low values of stress intensity, arcs having large values of R/t may be used, and it is often better to have a surface composed of one large arc terminated by a small radius than a surface composed of a series of flats joined together by arcs of small radii. In the case of the arc of large radius, it will be found sometimes that the extremities of the calculated contour overlap, thus giving an impossible shape for a die. For example, if parts of cross section, Fig. 12, were required, then the first operation of rolling could be performed with the rolls, Fig. 13 A and B, correct angles and radii for the spring-back give the shape shown in Fig. 14. In a case like this, a certain amount of bending may be done along part of the arc, as shown in Fig. 15, portion *x*. Then allowing this to spring back, to bend a further portion (*y*) of the arc as shown in Fig. 16. Thus is the required shape obtained. The same process is necessary in working extremely thin strip. The above cases provide on their own account very good arguments for continuous heat-treatment. Sections of this contour, however, are not required in large quantities.

On the drawings giving the stages of forming, the centres from which the various radii are struck should be specified in relation to two axes at right angles, as indicated in Fig. 7A. Such centres are readily found by calculation and otherwise, and these dimensions are of great service to the template makers, and should be used as a check on the lay-out of the contours.

In new designs of members, close co-operation between



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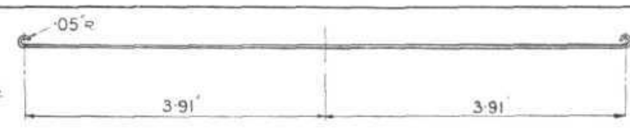
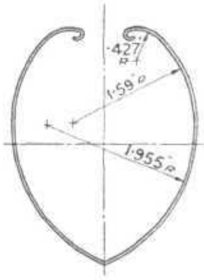
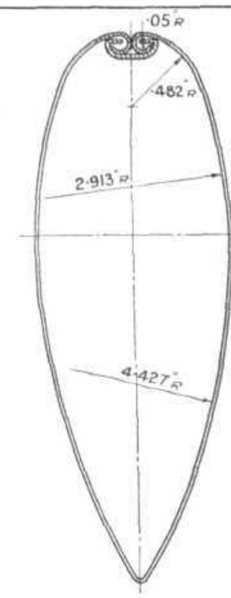


11A.



11B.

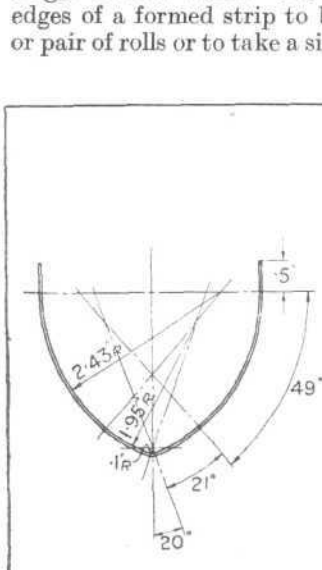


10.

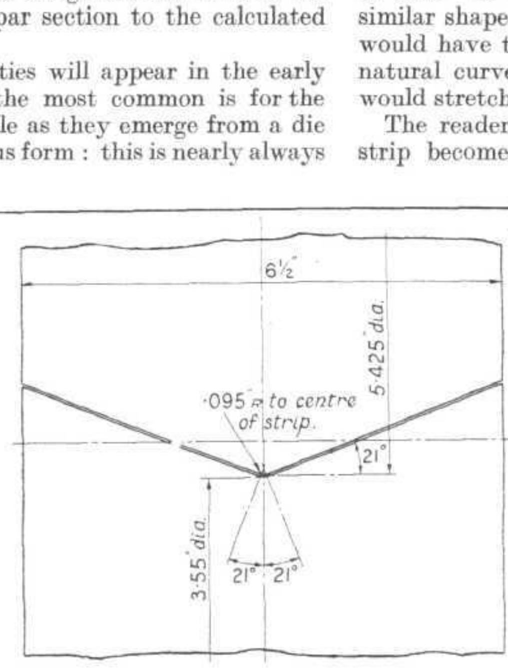
shops and drawing office can often save much unnecessary labour. For example, suppose a spar has been designed having overall dimensions 4 ins. by 2 ins., and suppose that when the first sample or test specimen of spar is made up, the overall dimensions are $3\frac{15}{16}$ ins. by $2\frac{1}{16}$ in., then if the spar produced withstands its specified test load, and it is known that spars of these dimensions and having the same uniform material can always be produced, it is obviously easier and cheaper to modify the design than to remake the tools to produce the original spar section to the calculated dimensions.

It is true that minor difficulties will appear in the early stages of this work. One of the most common is for the edges of a formed strip to buckle as they emerge from a die or pair of rolls or to take a sinuous form: this is nearly always due to the strip being wrongly fed into the tool, causing a *stretching* of the material at the edges. By altering the method of lead-in this trouble can usually be overcome. As illustrating this, if we have a rectangular piece of paper held so that one end is in the form of a circle, the other end being left flat, and then an attempt is made to deform the sheet so that the end curve will lie in a plane at right angles to the centre line of the paper, then the long edges will tend to tear. If this were steel strip, and the die gap was of similar shape to the curved end of the paper, then the strip would have to be fed in so that the edges could follow the natural curve indicated by the paper, otherwise the edges would stretch and finally wave.

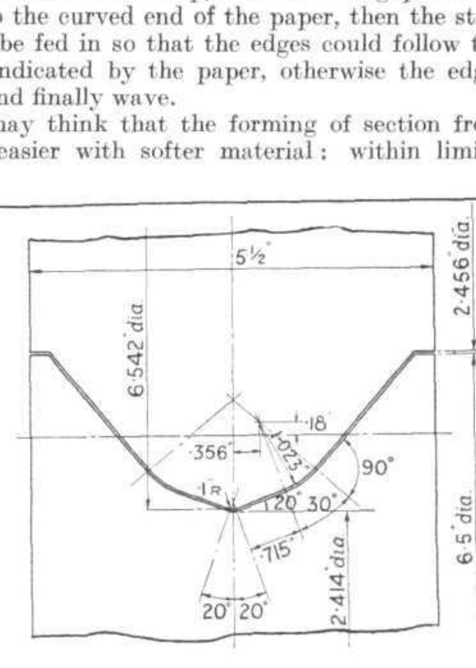
The reader may think that the forming of section from strip becomes easier with softer material: within limits,



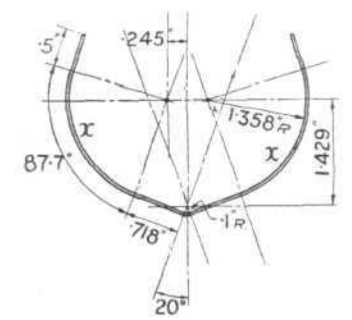
12.



13A



13B



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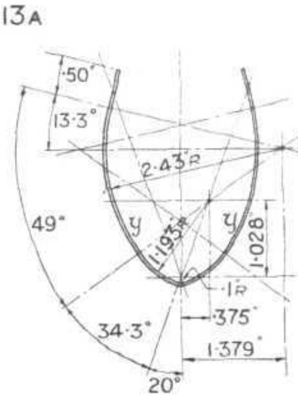
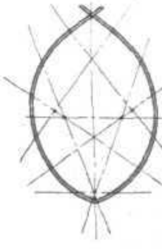


16.



14.

this is so, but the successful forming of very soft materials is often far more difficult than corrugating steel of S. 40 standard; for example, in one case, four pairs of rolls were required to produce a certain section from material of proof stress 18 tons per sq. in., and only two pairs when the proof stress was 70 tons per sq. in., the gauges being the same in each case, but that was simply because the soft material could not withstand the work of deformation on two pairs of rolls without buckling and it had to be done by more gradual stages.

It is clear from the foregoing considerations that this matter of corrugating and section forming is a subject that teems with interest in both its theoretical and practical aspects.

FACTORS IN SEAPLANE FLOAT DESIGN

By WM. MUNRO

Conflicting requirements in the design of seaplane floats necessitate a compromise in shape to give the most satisfactory all-round results.

These requirements may be stated in order of importance as:

(1) Clean water performance and stability.
(2) Reasonable air resistance.

It is possible to eliminate a considerable amount of experimental work, and to draft out speedily a good lines drawing, with the aid of a suitable set of coefficients compiled from other successful floats, for a variety of machines.

The coefficients used in this method are

(*a*) Midship area coefficient.
(*b*) Coefficient of fineness of water-plane.
(*c*) Block coefficient.
(*d*) Linear ratios.
(*e*) Moment of inertia coefficient.

(*a*) Is the ratio of the area of the midship section of the float to the rectangle ABCD which encloses it. (See Fig. 1.)

(*b*) Is the ratio of the water plane area of the float to the rectangle EFGH which encloses it. (See Fig. 2.)

(*c*) Is the ratio of the volume of the float to the volume of a block having the same overall length, same extreme breadth, and same extreme depth.

This will give the proportions of a normal British float of accepted present-day design for a seaplane inside the weight range of 3,000-7,000 lbs., the flotation system being twin-floats with turtle deck and vee bottom, and with one step approximately at midships.

The turtle deck is the favourite type in England because of (*a*) the strength of the section, and (*b*) the immediate drainage of water from the float top. No great difficulty has been experienced in providing adequate walkways along the float top where necessary.

The step should be situated close to the centre of gravity of the machine, since, when getting off, the machine rides on the step.

The function of the step is to create a break in the continuity of flow of the water, which reduces suction and helps the machine to get off the water.

The vee shape of planing bottom has the obvious advantage of reducing shock when alighting, and is adopted for this reason, although inferior to the flat planing bottom from the "unsticking" point of view.

For the type indicated above the coefficients would be:

Midship area coefficient	= 0·75
Coefficient of fineness of waterplane ...	= 0·68
Block coefficient	= 0·47

It will be appreciated that by the tabulation of coefficients for particular types of seaplane, one can obtain more accurate figures for any particular type than those given above, but this is unnecessary, as will be indicated in the part of this article dealing with "Floats of Similar Form."

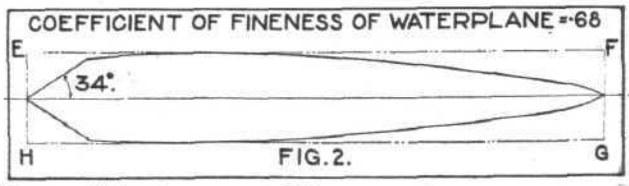


FIG. 2.

The coefficients suggested here are the mean values of a large number of machines of the total weight range mentioned, and can be utilised to give reasonable float proportions and lines.

The method is similar to that used by naval architects; the difference in application lies merely in the coefficient values used for seaplane practice.

It is to be noted that the assumption is made that the seaplane has a considerable margin of power.

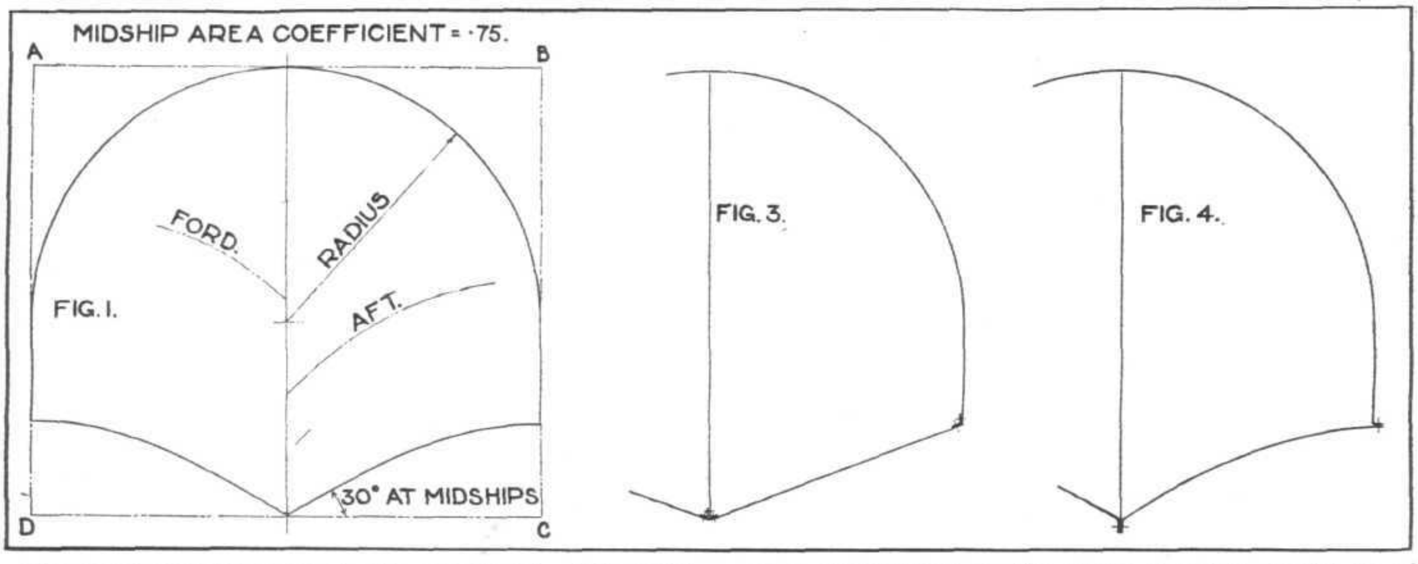


FIG. 1. FIG. 3. FIG. 4.

The angle of entry must also be considered. This point will be dealt with more fully when outlining the problem of wave-interference.

(*d*) The ratios of length, breadth and depth of the float are taken as follows:—

If L = overall length of float
B = greatest breadth.
D = greatest depth.

Then D should equal $1 \cdot 13 \times B$.
And L „ „ $8 \times B$.

In a racing machine the floats, however, would be of lesser beam to delay planing and the opposite would be the case for a machine whose margin of power was low.

Assuming now a total float volume of 4,500 lbs. required, and using the coefficients and length breadth and depth ratios given, we get

$$0 \cdot 47 \times L \times B \times D = \text{total vol. of float} = \frac{4,500}{64} \text{ cub. ft.}$$

$$\therefore \; 0 \cdot 47 \times 8B \times B \times 1 \cdot 13\, B = \frac{4,500}{64} \text{ cub. ft.}$$

$\therefore$ B = 2·54 ft. = 30·5 in.
and D = 1·13 × 30·5 = 34·5 in.
and L = 8 × 2·54 = 20·3 ft.

Taking the vee angle of the planing bottom as 30°, the midship section can readily be drawn in to give a midship-area coefficient of 0·75, checking the area with the aid of the planimeter.

Figs. 3 and 4 show the old and the new shapes of planing bottom. The flare on the bottom shown in Fig. 4 is reminiscent of the bows of torpedo-boats and light cruisers. It accomplishes two useful purposes. It reduces the spray angle, lessening the height of the cone of water developed between the floats when taxying, and further, is found to add to stability in a longitudinal direction.

The effect of a locally extended planing bottom on rolling is also of interest, in particular with large machines where the chine becomes the equivalent of a bilge keel, giving a steadying effect without seriously increasing water resistance.

The next step is to draw in the keel line on side elevation, the after body keel line being a straight line at approximately 7° above the horizontal. The chine line aft is similarly a straight line curving down at the end station to meet the keel line.

The depth of step necessary is dependent on the "getting-off" speed of the machine.

As the "getting-off" speed decreases, a deeper step is required. To determine approximately the depth of step divide the extreme breadth of the float by thirteen.

The body sections of the forward portion of the float should be designed to give a centre of buoyancy situated forward of the step, to allow the machine to trim up by the nose and ride cleanly at anchor.

The top of float is taken as horizontal over the entire length. For aerodynamic reasons, floats have been specially built for racing machines with a "cigar" nose.* It is considered, however, that the value of this shape for other than racing craft is outweighed by considerations of expenditure in manufacture, and from the service view-point it seems a debatable point whether the amount of reduction of drag is not offset by the probable encouragement given to the floats to nose under when pitching in rough water at anchor.

It is assumed that the reader is familiar with the process of fairing-in the lines by the use of waterlines, half-breadths and buttocks.

There is, unfortunately, no royal road or short-cut to the actual "fairing-in" of the lines. The body-sections have now to be drawn in to give the required volume, the load waterline determined and its shape laid off in plan to see how near it comes to the desired coefficient of fineness.

By using an angle for V-bottom of 30° at midships, varying to 40° at bow and 35° aft a minimum of trial and error will be involved to obtain the required results. (See Fig. 1.)

The lines plan is generally drawn to a convenient scale in the drawing-office, but, following ship practice, the lines are later laid out full size in the shops, corrected for fairness, and a corrected list of offsets supplied to the drawing-office to which the detail design of parts can be accurately carried out.

Before fairing-in the lines finally for model test it is advisable to try out the approximate metacentric height of the flotation system. This is done by using a coefficient for the moment of inertia of the waterplane.

The track of the floats is assumed to be approximately fixed on the general arrangement drawing of the machine and likewise the position of centre of gravity of the machine is assumed known.

The moment of inertia coefficient may be taken as 0·04. Then

$0{\cdot}04\ L\ B^3$ = Moment of inertia of one float about c.l. of float.

Where L = Length of float.

And B = Breadth of float.

And I_0 = moment of inertia about c.l. of machine = 1 + (area of W.P. × $\frac{1}{2}$ track²).

* These floats proving highly satisfactory in all respects.

Transverse metacentric height $= \frac{I_0}{V} - B\,G.$†

Where V = Displacement in lbs.

And B G = Distance between centre of gravity of machine and C.B. of float.

This is worked out and if considered satisfactory, a model of the floats with the given track is constructed on, say, a tenth scale for the purpose of tank tests which will determine the finally corrected lines which later will be laid down full-size for constructional purposes.

It may be stated here that tank tests are indispensable. A set of float lines may look fair and meet all the established requirements, but tests in the tank will in ninety-nine cases out of a hundred indicate where improvements in cleanliness of running and in longitudinal stability can be effected.

It has only to be recollected that naval architects with over a 100 years' accumulated data in the matter of ship form design, still consider tank tests of hull-shapes a necessity, to appreciate the position of the designer of seaplanes.

For this reason, the method indicated of using coefficients to draft out the lines must not be regarded as other than a reasonably quick method of designing a float shape which is likely to call for a minimum of re-adjustment in proportions and contours.

Model Tests

The basis of all model tests is Froude's law of comparison. The law enables one to compare the resistances of—

(1) Model with full-size float.
(2) Floats of similar form.

It takes into account eddy-making and wave-making resistances but *not* frictional, *i.e.*, "skin" resistance, for which a correction is always made by naval architects in consideration of the disparity in length between the model and the full-size ship, since frictional resistance is expressed as :—

$$R = f\left(\frac{W}{W_0}\right) \times S \times \left(\frac{V}{6}\right)^{1 \cdot 83}$$

where R = resistance in lbs.
S = area of wetted surface in sq. ft.
V = speed in knots.
f = a coefficient depending on nature and length of the surface.
W = density of salt water.
W_0 = density of fresh water.

In using Froude's Law of comparison there are certain conditions which must be observed.

(*a*) Speed.

"In comparing similar vessels, or vessels with models, the speed must be proportional to the square root of their linear dimensions."

The linear dimension is taken as the overall length of the float; for example, the speed at which the model would have to be run to give comparable results with a float 20 ft. long travelling at 30 knots would be arrived at as follows :—

Length of float = 20 ft.
" model = 2 ft.
V (speed of float) = 30 knots.
Let v = speed of model in knots.

$$\text{Then } \frac{V}{v} = \sqrt{\frac{20}{2}} = \sqrt{10}$$

$$\therefore v = \frac{V}{\sqrt{10}} = \frac{30}{\sqrt{10}} = 9{\cdot}5 \text{ knots.}$$

These speeds are referred to as "corresponding speeds."

When running the model, the latter is loaded to the equivalent water-borne weight for each speed, these speeds ranging from about 10 knots to 50 knots for full-size machine.

† See "Seaplane Stability Calculations," AIRCRAFT ENGINEER, Feb. 23 and March 29, 1928.

To determine the water-borne weight at each speed, we assume the V^2 law and when

Wa = air lift.
Ww = water lift.
W = total weight.
V_1 = getting-off speed.

we have

$$(1)\ Wa + Ww = W$$

Then Wa at any velocity V will be given by

$$\frac{WV^2}{V_1^2} = Wa$$

substituting this in (1) we have

$$\frac{WV^2}{V_1^2} + Ww = W$$

$$\therefore \frac{V^2}{V_1^2} = \frac{W - Ww}{W}$$

But $W - Ww = Wa$ from (1)

$$\therefore \frac{V^2}{V_1^2} = \frac{Wa}{W} \text{ or } \frac{Wa}{V^2} = \frac{W}{V_1^2}$$

Values of Wa are obtained from the above for the various speeds, and are deducted from W to get the required water-borne weight, Ww.

Also the floats are run in test at the angle which will hold good for the full-size floats when in position on the machine, and the load on the floats is applied at a point which represents the centre of gravity of the machine.

The carrier to which the model float system is attached during test can rock about a horizontal transverse axis, "the axis being situated relative to the model at the same height and longitudinal position to scale as the centre of gravity of the complete machine to its floats. Weights are so arranged on the float carrier that the centre of gravity of the whole is on this axis."

This carrier is supported by a light transverse vertical frame which in turn is attached (with an arrangement securing minimum friction) to the towing carriage of the tank.

"A towing eye can be attached to the float carrier at any height, corresponding to scale to the height of the propeller axis on the machine. The float and frame is towed from this eye by a horizontal gate, the fore end of which is carried on a transverse vertical frame.

"A balanced towing rod connects this forward vertical frame to the lower end of the carriage dynamometer or by the spring attached to it, at its upper end.

"The extension of this spring (as the towing carriage is moved down the tank) required to balance the float resistance is recorded on the drum."*

The trim of the float is also mechanically registered and noted at the various speeds of the tests.

The resistance at each particular speed of the model is then noted and tabulated.

(*b*) Resistance.

If the linear dimensions of a vessel be L times the dimension of the model, and the resistances of the latter at speeds V_1, V_2, V_3, etc., are R_1, R_2, R_3, etc., then at the corresponding speeds of the vessel, the resistance of the vessel will be R_1L^3, R_2L^3, R_3L^3, etc.

As our model speeds are "corresponding speeds" and we have obtained values of resistance of the model at these speeds, we can now determine the resistance of the full-size float system at each corresponding speed by multiplying each of the model resistances by L^3, which, in the case supposed, would be $\left(\frac{20}{2}\right)^3$. The correction for frictional or skin resistance is, however, yet to be considered, since it is understood that Froude's Law of Comparison deals only with *resistances other than frictional.*

Correction for Frictional Resistance.

This correction as already mentioned is considered necessary in ship-work when dealing with a comparison between model and full-size ship.

The frictional resistance of the ship's model is arrived at from the formula :—

$$R = F\left(\frac{W}{W_0}\right) \times S \times \left(\frac{V}{6}\right)^{1\cdot83}$$

The difference between this curve and the curve of total resistances plotted from the tank tests, gives at any speed the residuary resistances of the model—that is to say, the resistances other than frictional.

These "differences" are multiplied by L^3 (which is the ratio of linear dimensions) and the results are the residuary resistances of the full-size ship at corresponding speeds.

It is now only necessary to add to each of these results the frictional resistance of the full-size ship at each speed to construct the required corrected curve of total water resistance for the ship.

To obtain this we use the same formula :—

$$R = f\left(\frac{W}{W_0}\right) \times S \times \left(\frac{V}{6}\right)^{1\cdot83}$$

The value f is taken from the following table to suit, in the first case, the model length and in the second case the ship length.

FROUDE'S RESISTANCES PER SQ. FT. IN LBS. OF VARIOUS SURFACES AT 600 FT. PER MIN.
LENGTH OF SURFACE IN FEET.

Nature of Surface.	2 Feet.		8 feet.		20 Feet.		50 Feet.	
	Power of speed to which resistance is proportional.	Resistance in lbs. per sq. ft.	Power of speed to which resistance is proportional.	Resistance in lbs. per sq. ft.	Power of speed to which resistance is proportional.	Resistance in lbs. per sq. ft.	Power of speed to which resistance is proportional.	Resistance in lbs. per sq. ft.
Varnish ...	2·00	0·41	1·85	0·325	1·85	0·278	1·83	0·25
Tinfoil ...	2·16	0·30	1·99	0·278	1·90	0·262	1·83	0·246
Calico ...	1·93	0·87	1·92	0·626	1·89	0·531	1·87	0·474
Fine Sand	2·00	0·81	2·00	0·583	2·00	0·480	2·06	0·405

f is the resistance in lbs. per sq. ft. given in table.

It will be apparent, however, that with a seaplane we cannot directly apply the methods of naval architecture.

In the first place, we are dealing with *two* floats, and it has been shown that the sum of the individual resistances of the floats differs from the total resistance of the system.†

Further, the wetted surface area of the floats varies at each speed, diminishing to zero at "taking-off" speed, and consequently (even assuming a perfect float on which the decrease is steady), the calculation of the skin resistance at each speed presents more than a little difficulty.

The fact of no skin resistance correction being made on float model tests accounts for some of the minor discrepancies which occur between the behaviour of full-size seaplanes and that predicted from model tests.

The following table given by Mr. G. S. Baker, O.B.E., of the National Physical Laboratory, in a paper read before the Royal Aeronautical Society indicates in what respects model conditions differ from those found in the flying of an actual machine, and shows that even tank-tests have their limitations.

Differences between Machine and Model Tests.

Full Size	Model
Screw Thrust equals water resistance plus air structure resistance plus acceleration force.	Corresponding thrust equals water resistance plus air resistance of hull and model structure.
Speed is increasing all the time.	Speed is steady.

* See "Ten Years' Testing of Model-Seaplanes," by G. S. Baker, O.B.E., M.I.N.A.

† See "Effect of Divergent Waves on Resistance of Floats," by E. G. Barillon (Ing. Paris), Nov. 4, 1926.

Full Size.	Model.
Load on Water varies with wind force and trim of hull.	Load on water is adjusted for any speed and true for one trim only.
Trim at all high speeds is determined by the air structure.	Trim of model at high speeds depends mainly on water forces.
Pitching is damped to some extent by the wings and tail system of planes.	No material damping against pitching.
Normally the water surface is broken into waves varying up to two or three feet in height.	Experiments usually made in smooth water, occasionally in rough.

A useful figure to note here is that in comparing similar floats the area of the wetted surface may be taken as proportional to the two-thirds power of the displacement, *i.e.*, $W^{2/3}$.

Having obtained from the tank test the total water resistance, and ignoring the limitations stated, the total air resistance of remainder of *m/c* is calculated and the two resistances added.

From this the total effective thrust and E.H.P. required to maintain the speed on the water is calculated, and a curve is plotted of E.H.P. on a base of speeds from V = O to V = VI.

On the same base the effective horse-power available curve is plotted off, and if the machine is to "unstick" in a calm, these curves must not intersect, *i.e.*, the E.H.P. required must not be more than E.H.P. available between these speeds.

Floats of Similar Form.

It is quite often convenient and desirable to construct a flotation system geometrically similar to one previously designed for a machine the weight of which was in the same neighbourhood as the projected machine, built for generally similar purposes, and with the floats set at the same angle relative to the wing chord.

In such a case (assuming that the original design was satisfactory in water-performance), Froude's Law of Comparison can again be used, and the "design" of the float shape becomes a matter of proportioning up.

The cube root of the ratio of the total buoyancy of the new float to the total buoyancy of the old float is taken as the ratio of the linear dimensions.

If we take for an example the float used in the writer's previous article on "Seaplane Stability Calculations," we have

Weight of machine	= 4,854 lbs.
Total buoyancy of float ...	= 4,630 lbs.
Length of float	= 20·7 ft.
Breadth of float	= 34·76 in.
Depth of float	= 30·25 in.

Supposing now a set of floats to be required for a similar machine with a weight of 5,500 lbs., the reserve buoyancy to be the same in both cases, say, 90 per cent.

Then the length, breadth, depth, and all linear dimensions given in the table of offsets will be found for the new floats by using a multiplier which is the cube root of the ratio of the two total volumes, *i.e.*,

Total volume of original float =

$$\frac{4{,}854 + 90 \text{ per cent. of } 4{,}854}{2} = \text{X}.$$

Total volume of required float =

$$\frac{5{,}500 + 90 \text{ per cent. of } 5{,}500}{2} = \text{Y}.$$

$$\therefore \text{ The multiplier} = \sqrt[3]{\frac{\text{Y}}{\text{X}}} = \text{say, } \alpha.$$

The length of required float will be $20 \cdot 7 \times \alpha$ ft.
The breadth of required float will be $34 \cdot 76 \times \alpha$ in.
The depth of required float will be $30 \cdot 25 \times \alpha$ in.

Similarly, the ratio of waterplane areas can be immediately assessed as the square of the cube root of the ratio of total volumes, *i.e.*—

$$(\sqrt[3]{\alpha})^2 = \alpha^{2/3}$$

Taking the area of waterplane of original float as 41·25 sq. ft., then the area of waterplane of new float will be

$$41 \cdot 25 \times \alpha^{2/3}$$

This obviates the necessity of a detailed calculation of the waterplane area, which must be known when checking-out the static stability of the flotation system.

The position of the load-water-line below top of float would also be fixed by multiplying the existing dimensions in the original float by the multiplier α.

This, of course, applies only when the reserve buoyancy is the same in both cases.

Had a reserve buoyance of 100 per cent. been required in the new design, then a geometrically similar shape would be arrived at by taking the total volume of required float as

$$5{,}500 \text{ lbs.} + 100 \text{ per cent.} = \text{say, } \text{Y}_1$$

and a different multiplier would be used derived from

$$\sqrt[3]{\frac{\text{Y}_1}{\text{X}}}$$

For proportioning up, the procedure would be as before but the position of the load water line would have to be determined by "trial and error," and the fore and aft position of the Centre of Buoyancy would have to be calculated.

With equal reserve buoyancy in the old and new floats, the fore and aft position of the Centre of Buoyancy would be found in the same manner as all other linear dimensions, that is, the distance from the step in inches on the old float would be multiplied by the value α.

(To be concluded.)

TECHNICAL LITERATURE.

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS.

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C. 2; 28, Abingdon Street, London, S.W.1; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; or 120, George Street, Edinburgh; or through any bookseller.

THE IMPORTANCE OF "STREAMLINING" IN RELATION TO PERFORMANCE. By Professor B. M. Jones, M.A., A.F.C. R. & M. No. 1115 (Ae. 288). (15 pages and 2 diagrams.) September, 1927. Price 9*d*. net.

The author is of opinion that more attention should be directed to researches towards improving performance than has been given in the past. With this idea in mind, he makes a general examination of the factors governing performance, and came to the conclusion that the most hopeful line of attack is that directed towards obtaining a better streamline flow about the aeroplane than is apparently obtained at present. Other factors, such as the improvement of airscrew efficiency by the use of variable-pitch screws and the reduction of induced drag by means of increased aspect ratio or better plan form may be important, but they do not show promise of improvement of the same order of magnitude as that which may be gained by improved streamlining, and, moreover, their realisation is not being held back so much by lack of aerodynamic knowledge as by structural and other difficulties.

The improvement of streamlining, on the other hand, whilst holding out promise of very great improvement of performance, is also definitely retarded by lack of aerodynamic data relating to the kinds of shape which give rise to streamline flow; almost our only reliable information on this matter relates to the simplest forms acting in air undisturbed by the screw slipstream.

It therefore appears that it is towards the accumulation of experimental and, if possible, theoretical information, relating to the obtaining of good streamline motion around all the parts of an aeroplane, that attention should now be directed. The present note deals solely with the empirical side of such an investigation.

The performances of certain aeroplanes are compared by an empirical formula with the skin friction resistance of a flat plate, and the comparison suggests that great improvement is possible. Certain suggestions for experiments are made, including body-airscrew interference, excrescences, and the cooling of air-cooled engines.

ANALYSIS OF EXPERIMENTS ON AN AIRSCREW IN VARIOUS POSITIONS WITHIN THE NOSE OF A TRACTOR BODY.—By C. N. H. Lock, M.A. R. & M. No. 1120 (Ae. 293). (20 pages and 9 diagrams.) September, 1927. Price 1*s*. net.

An attempt has here been made to place on a calculable basis the interference effect of a tractor airscrew on an aeroplane body.

The methods of R. & M. 956* (somewhat modified) have been applied to the analysis of the experimental results of R. & M. 1030† on the performance of an airscrew situated in various positions within the nose of a tractor body. Analysis of experimental thrust grading curves with a single airscrew determines an empirical parameter, which is a function of radius in the plane of the airscrew, and which represents the effect of the body on the axial inflow; it should provide a sufficient basis for the calculation by strip theory of the performance of any airscrew not differing too greatly in design, in the same position relative to the body.

From considerations of momentum, the thrust and torque on the screw are related to the supposed axial resultant of the pressure over the whole of the forward portion of the body. The difference between the calculated airscrew thrust and the resultant pressure defines an "effective" thrust which gives an "effective" efficiency agreeing closely for given torque with the efficiency of the exposed portion of the airscrew calculated without body interference. The remainder of the observed body drag is assumed to be due entirely to the airscrew slipstream, and may be separated into a part representing the effect of increased velocity and a part due to the "spoiling of the shape" of the body by the increase of turbulence. The former part should be independent of the drag of the body alone, and is determined by comparing a number of experiments in which the body drag was modified by adding "excrescences" in position where they did not appreciably influence the airscrew. This method gives a value of the drag corresponding to increased velocity

$$R/R_0 = 1 + 3{\cdot}6\,T_{c_2}$$

where T_{c_2} is the coefficient of "effective" thrust as defined above. On including the effect of "turbulence," the coefficient of T_{c_2} is increased to 4·5 in 4 cases out of 6, and the remaining cases, when the screw is far back in the body with pointed nose, to 8 and 10.

The report concludes that the mutual influence of airscrew and body includes (*a*) an effect of the body on the torque for given V/nD, with an "effective" efficiency equal for given torque to the efficiency of the exposed portion of the blades calculated without interference, and (*b*) the slipstream effect on the body drag as defined above. For a body of normal size (*a*) is very small, and only (*b*) is of importance.

* R. & M. 956. The airflow round a body as affecting airscrew performance.—Lock, Bateman and Townend.

† R. & M. 1030. On the effect of placing an airscrew in various positions within the nose of a streamline body.—Bateman, Townend and Kirkup.

THE DISTRIBUTION OF STRESS AND STRAIN IN THE WÖHLER ROTATING CANTILEVER FATIGUE TEST.—By W. Mason, D.Sc., and N. P. Inglis, Ph.D., M.Eng. Work performed for the Engineering Research Board of the Department of Scientific and Industrial Research. R. & M. No. 1126 (M. 52). (40 pages and 19 diagrams.) October, 1927. Price 1*s*. 6*d*. net.

The following types of specimens were tested under two-point loading, giving uniform bending over a parallel length of 1 in.:—

Solid of 0·2-in. diameter
Hollow, of wall thickness $\frac{1}{32}$-in., $\frac{1}{4}$-in. bore.
Hollow, of wall thickness, $\frac{1}{64}$-in., $\frac{1}{4}$-in. bore.

The tests were directed to the following objects:—

(1) To compare the limiting ranges of solid and hollow specimens.
(2) To find the cyclic fibre strain at limiting and other ranges.
(3) To estimate the actual stress in the fatigued specimen.

A certain relation between the maximum cyclic strain and applied bending moment has been found. The importance of this strain as a determining factor in relation to the endurance has been shown. The actual skin stress in thin-walled hollow specimens has been calculated, and estimates made of this stress for solid bars.

HEAT TRANSFER IN INTERNAL COMBUSTION ENGINES.—By H. Moss, D.Sc., A.R.C.S., D.I.C., of the Air Ministry Laboratory. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1129 (E. 28). (30 pages and 6 diagrams.) September, 1927. Price 1*s*. 3*d*. net.

The primary objects of the investigation were (1) to obtain the relationship between heat transfer and gas density under conditions of engine turbulence, and (2) to investigate the assumption underlying the method of phase-setting of engine indicators that the maximum pressure during motoring occurs at top dead centre.

A Benz single-cylinder engine was motored at speeds from 600 to 1,400 r.p.m. with intake air at pressures varying from half to double normal atmospheric pressure and at temperatures from 15° C. to 90° C. (corresponding to maximum temperatures from 320° C. to 450° C.). In Part I, tests are described on the heat received by a flow of water in a tube passing through the clearance volume. Part II. consists of an account of measurements of the heat gains and losses of the air passing through the engine, the losses of the air being presumably gains to the walls and water-jacket. In Part III. the heat gained during the suction stroke is obtained from the volumetric efficiency and the heat transfers during the other strokes is deduced.

It was found that the heat transfer in unit time was proportional to the temperature difference between gas and wall and to the square root of the gas density. In the neighbourhood of 1,200 r.p.m. it was proportional to the square root of the speed, and for a more extended range to $\log(1 + cn)$ where c is a constant. The coefficient of heat transfer was much greater for the suction stroke than for the remainder of the cycle.

By extrapolation, the heat conducted from gas to walls when running under power was found to be about one-half of the total heat losses, the remainder being due to radiation. The total heat losses are also proportional to the square root of the gas density. The increase of the temperature gradients in the metal when an engine is supercharged are not important and the increase of valve temperature is small. The error involved in the method of phase setting of indicators by means of the motoring curve is less than one-quarter of a degree of crank angle.

LIFT AND TORQUE OF AN AUTOGYRO ON THE GROUND.—By H. Glauert, M.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1131 (Ae. 301). (4 pages and 2 diagrams.) July, 1927. Price 4*d*. net.

The lift and torque have been derived for any windmill in the static condition, and the equations are given for calculating these quantities in a wind of 20 m.p.h., one particular numerical case being worked out in detail. The values for a wind of 10 m.p.h. must be estimated by interpolation as the theory is not valid for so low a speed.

In the static condition the lift is very small, and in a wind of 20 m.p.h. the lift is proportional to the tip speed. At a given tip speed the lift increases and the torque decreases as the angle of incidence rises from 8° to 12°.

ON THE VERTICAL ASCENT OF A HELICOPTER. By H. Glauert, M.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1132 (Ae. 302). (14 pages and 6 diagrams.) November, 1927. Price 9*d*. net.

The present report deals only with the vertical ascent of a helicopter, and for simplicity the analysis is limited to the case of an airscrew with constant chord along the blades.

The analysis based on the Vortex Theory of Airscrews shows that a helicopter airscrew should be of large diameter, in order to secure a light loading of the disc, and also of large blade area. To obtain the best rate of climb the blade angle should be adjustable in flight.

The problem of the horizontal flight of a helicopter will form the subject of a further report.

WIND TUNNEL TESTS WITH HIGH TIP SPEED AIRSCREWS. THE CHARACTERISTICS OF AIRSCREW SECTION R. & M. 322, No. 4, AND R.A.F. 32.—By W. G. A. Perring, R.N.C., A.M.I.N.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1134 (Ae. 304). (8 pages and 3 diagrams.) January, 1928. Price 6*d*. net.

The present experiments continue the investigations into the effect of tip speed on airscrew performance reported in R. & M. 1086, 1091, 1123 and 1124.*

Thrust and torque grading experiments have been carried out on model airscrews of the following blade sections:—

(1) An airscrew of the conventional type of blade section, having a flat undersurface and a maximum thickness of 12·7 per cent. c. The section was No. 4 of a series of airscrew sections suitable for airscrew design contained in R. & M. 322.

(2) An airscrew with blades of R.A.F. 32 aerofoil section.

The tests have been carried out up to tip speeds 1·3 times the velocity of sound, and the lift and drag coefficients of the blade sections for speeds up to the speed of sound have been deduced from the results.

The general results for both sections are similar to those obtained in previous tests. Both sections have exceptionally large drag at high speeds, and the conventional airscrew section compares very unfavourably with the thinner section of the same type previously tested. At speeds above 0·7 of the speed of sound both sections pass through a critical stage, when the characteristics appear to depend both on the Reynolds' number and the actual speed.

It is proposed to extend the tests upon the conventional airscrew section R. & M. 332, No. 3 (R. & M. 1124), to give results at a higher Reynolds' number: an airscrew for this purpose, having increased blade widths to the one previously tested, is in course of construction. Preparations are being made to test a conventional airscrew section with 8 per cent. c. maximum thickness and also sections R.A.F. 27 and R.A.F. 28.

* R. & M. 1086. Wind tunnel tests with high tip speed airscrews. The characteristics of the aerofoil section R.A.F. 31 at high speeds. By G. P. Douglas and W. G. A. Perring.

R. & M. 1901. Wind tunnel tests with high tip speed airscrews. The characteristics of a bi-convex aerofoil at high speed.—By G. P. Douglas and W. G. A. Perring.

R. & M. 1123. Wind tunnel tests with high tip speed airscrews. The characteristics of bi-convex No. 2 aerofoil section at high speeds.—By G. P. Douglas and W. G. A. Perring.

R. & M. 1124. Wind tunnel tests with high tip speed airscrews. The characteristics of a conventional airscrew section aerofoil R. & M. 322, No. 3, at high speeds.—By Douglas and Perring.

THE EFFECT OF COMPRESSIBILITY ON THE LIFT OF AN AEROFOIL.—By H. Glauert, M.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1135 (Ae. 305). (8 pages and 2 diagrams.) September, 1927. Price 6*d*. net.

At ordinary aeroplane speeds the effect of the compressibility of the air is very small and there is complete justification of the usual assumption that the air may be regarded effectively as an incompressible medium. This assumption, however, ceases to be valid in the case of high tip speed airscrews, and is not really satisfactory even when the tip speed is no greater than 800 f.p.s. It is important therefore to examine, both theoretically and experimentally, the effect of compressibility at high speed on the characteristics of an aerofoil. Experimental investigations are in progress at the Royal Aircraft Establishment in which the aerofoil characteristics are derived by analysing the observed behaviour of high speed model airscrews, but owing to the complexity both of the experiments and of the analysis, it is impossible that the results should have the same accuracy as those obtained from direct tests of an aerofoil at low speed.

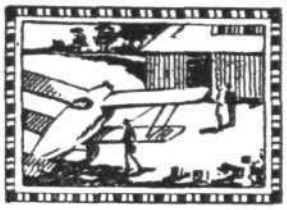
As the speed increases to 0·6 of the velocity of sound, the theory here developed shows that the slope of the lift curve increases without any charge in the angle of no lift. There is then a critical region in which the lift falls fairly rapidly until at the velocity of sound the lift curve is again a straight line with the same general slope as at low speeds, but passing approximately through zero angle of incidence.

These general theoretical conclusions are in agreement with the experimental evidence available,* and suggest that the most satisfactory aerofoil shape for high speed airscrews might be a symmetrical section.

* R. & M. 1123. Wind tunnel tests with high tip speed airscrews. The characteristics of bi-convex No.2 aerofoil section at high speeds.—By G. P. Douglas and W. G. A. Perring.

R. & M. 1130. A high speed wind channel for tests on aerofoils.—By T. E. Stanton.

PRIVATE FLYING



A Section of FLIGHT in the Interests of the Private Owner, Owner-Pilot, and Club Member

MY SEAPLANE RECORD

By LADY HEATH

The Short "Mussel" seaplane is a very interesting experiment which, unfortunately, Messrs. Short Bros. are not putting into production. It is a low-winged monoplane with the thick American M.12 wing section which gives it a very interesting performance. The span is 38 ft., length 25 ft. and height 11 ft. The entire construction of the machine is of metal. It is fitted with a special metal propeller made by Messrs. Short Bros. weighing 18 lbs. The engine is a Mark II Cirrus, and an interesting self-starter in the form of a lever is fitted, which is entirely reliable. The weight empty of this seaplane is 1,135 lbs. When fully loaded for my record climb its total weight was 1,636 lbs.—a big weight for the little 30-80 h.p. Cirrus engine. We had to add 46 lbs. of ballast to the weight of pilot and passenger in this case to bring it up to the F.A.I. requirements of 150 kgs. for weight of occupants.

Messrs. Short and Mason very kindly lent me one of their barographs. They have under construction a barograh reading up to 50,000 ft. in height and of 50 hours' duration for me, as I have found that there are no really good barographs available at either the Royal Aero Club or any of the firms in this country. Miss O'Brien, who is doing very well as a commercial pilot, kindly consented to be my passenger for the flight, and enjoyed her experience so much that when I left Rochester she stayed behind to take dual with Mr. Lankester Parker on it as she is as anxious as I was to learn seaplane work. The "Mussel" is extremely easy to manage and handle in all weathers, also on the water, as it is fitted with water rudders.

The F.A.I. regulations for light seaplanes necessitate, according to the bulletin of the Aero Club, March 30, 1927, a total maximum weight of 400 kgs., but they were kind enough to consider a proposition which I put forward directly to them in the summer of that year, and they raised the weight to 500 kgs. I was very much surprised to find that other light aeroplanes had not tackled any of these records, although in the form of seaplanes they came well within the weight. Although at the last moment I found that the Short "Mussel" weighed 30 kgs. more than the stipulated 500 kgs. I still attempted the record, and have requested the Royal Aero Club to accept it as a certified performance in the hope that it may stir the other seaplane constructors to raise the seaplane height record for Great Britain from this absurd figure to thirty or thirty-five.

The attempt was made at noon on July 10, the small machine taking off in little over 100 yards against a gentle tide and wind of about 12 m.p.h. The following are the time figures of the climb :—1,000 ft., 2½ mins. ; 2,000 ft., 4 mins. ; 3,000 ft., 7 mins. ; 4,000 ft., 14 mins. ; 5,000 ft., 17 mins. ; 6,000 ft., 22 mins. ; 7,000 ft., 27 mins. ; 8,000 ft., 34 mins. ; 9,000 ft., 41½ mins. ; 10,000 ft., 48 mins. ; 11,000 ft., 1 hr. exactly ; 12,000 ft., 1 hr. 12 mins. ; 13,000 ft., 1 hr. 24 mins. ; 13,400 ft., 1 hr. 32 mins.

The climb was not steady owing to some peculiar wind currents which, directly over Rochester and heading towards the north-west, gave no climb whatever. For instance, it took 7 mins. to climb from 3,000 to 4,000 ft. to get into a favourable current, and turning to the north-east one got from 4,000 to 5,000 ft. in 3 mins. The average rate of climbing at 60 m.p.h. on ground level appears to be roughly about 2 mins. a 1,000 ft. The machine was going pretty slowly at 13,400 ft., the last couple of 100 ft. taking about 5 mins. each, but given time, the machine could easily have gone to over 14,000 ft. Unfortunately, however, owing to thickness of the ink the barograph ceased to record.

At that height the best climbing speed of the machine appeared to be about 54 m.p.h. ; at 10,000 ft., 56 m.p.h. gave the best result. The revolutions of the engine were kept steady, close to 1,800 throughout the climb ; full throttle at the top only gave 1,820 revolutions, probably owing to the heavy propeller.

It was a particularly lovely day ; the higher up we went the clearer everything got, and we could see 30-40 miles with ease. Curiously enough, the wind direction remained constant throughout the climb, one's drift at 13,000 being the same as at ground level. The theoretical absolute ceiling empty of the machine is 15,000 ft., so with the full tanks and heavy load she had to carry, 13,400 ft. appears to be a good performance, and in the time it took, 1 hr. 32 mins., from first opening the throttle it was certainly all that could be desired by any private owner.

It is a great pity that there are not more private seaplane owners in this country. Any stretch of water 200-300 yards long is suitable for a machine of this type. Its condition is absolutely perfect, although it has been moored out in the Medway practically continuously in the last two years, a thing one cannot do with the wooden construction. For work in far Northern or far Southern regions, as also for work in the tropics, the material of which the "Mussel" is made is infinitely desirable, for our great trouble there is—in the extreme cold—the brittleness of wood, and in the tropics—the amount of shrinkage which occurs.

LADY HEATH'S SEAPLANE RECORD : The Short "Mussell" (Cirrus Mk. II) taking off from the Medway at Rochester to attempt the record on July 14, piloted by Lady Heath, with Miss S. O'Brien as passenger. It reached 13,400 ft.

LIGHT 'PLANE CLUBS

London Aeroplane Club, Stag Lane, Edgware. Sec., H. E. Perrin, 3, Clifford Street, London, W. 1.
Bristol and Wessex Aeroplane Club, Filton, Gloucester. Secretary, Capt. C. F. G. Crawford, Filton Aerodrome, Patchway.
Hampshire Aero Club, Hamble, Southampton. Secretary, H. J. Harrington, Hamble, Southampton.
Lancashire Aero Club, Woodford, Lancs. Secretary, C. J. Wood, Oakfield, Dukinfield, near Manchester.
Midland Aero Club, Castle Bromwich, Birmingham. Secretary, Maj. Gilbert Dennison, 22, Villa Road, Handsworth, Birmingham.
Newcastle-on-Tyne Aero Club, Cramlington, Northumberland. Secretary, A. H. Bell, c/o The Club.
Norfolk and Norwich Aero Club, Mousehold, Norwich. Manager, F. Gough, The Aerodrome, Mousehold, Norwich.
Nottingham Aero Club, Hucknall, Nottingham. Hon. Secretary, Cecil R. Sands, A.C.A., Imperial Buildings, Victoria Street, Nottingham.
The Scottish Flying Club, 101, St. Vincent Street, Glasgow. Secretary, Harry W. Smith.
Southern Aero Club, Shoreham, Sussex. Secretary, C. A. Boucher, Shoreham Aerodrome, Sussex.
Suffolk Aeroplane Club, Ipswich. Secretary, Maj. P. L. Holmes, The Aerodrome, Hadleigh, Suffolk.
Yorkshire Aeroplane Club, Sherburn-in-Elmet, Yorks. Secretary, Lieut.-Col. Walker, The Aerodrome, Sherburn-in-Elmet.

LONDON AEROPLANE CLUB

REPORT for week ending July 15.—Flying time, 82 hrs. 15 mins. Dual instruction, 29 hrs. 35 mins. Solo flying, 52 hrs. 40 mins.

Solo flying: P. A. Wills, E. A. Lingard, H. M. Samuelson, W. G. Robson, B. B. Tucker, S. Nesbitt, G. H. Craig, J. H. Saffery, E. E. Stammers, L. Rowson, W. Roche Kelly, C. Campbell, M. L. Bramson, G. N. Larden, R. Sanders Clark, Will Hay, P. W. Hoare, D. H. P. Esler, O. J. Tapper, T. E. Hearne, Miss Wilson, J. J. Hofer, J. C. V. K. Watson.

Dual instruction: E. H. Thierry, J. W. P. Chalmers, A. O. Wigzell, Miss Wilson, Miss V. M. Cholmondeley, H. W. Marlow, W. G. Robson, Miss Johnson, R. K. Koratkar, R. M. Doidge, R. S. Rattray, A. C. Thomas, E. Davis, C. Campbell, J. R. Rymill, R. Maurice, C. Reilly, J. Harrison, H. T. Molyneux, D. G. Prentice, T. E. Hearne, P. A. Wills, C. A. Bonniksen, G. A. Stedall, A. Hill Reid, C. R. E. Fenwick, P. W. Hoare, J. Bickley, Miss Hicks, J. C. V. K. Watson, L. Rowson, I. D. Lloyd, B. Carey, G. Lyon, Mrs. Thatcher, D. H. M. Symon.

Subscriptions.—Members are reminded that their subscriptions fell due on July 1 last, and should be sent to Secretary, London Aeroplane Club, 3, Clifford Street, London, W.1.

New Machine.—The club will take delivery of its new D.H. "Moth" Mark II Cirrus this week.

BRISTOL & WESSEX AEROPLANE CLUB, LTD.

REPORT for week ending July 14.—Flying, time 19 hrs. 20 mins. Flying time for previous week, 15 hrs. 40 mins.

Dual instruction (under Mr. Bartlett): Messrs. Godfrey, Lysaght, and Hughes; (under Mr. Tratman): Messrs. Hughes, Keeling, Heaven, Jellicoe, Greenhill, Laws, Singh, Peters, Davis, and Allinson.

Soloists:—Mr. Downes-Shaw, Godfrey, Jopp, Bathurst, Brewer, Holmes.

We regret to report that Mr. E. B. W. Bartlett, our instructor, was taken ill with appendicitis and operated on on Wednesday. He is doing well, and we hope to have him back before very long. Mr. Tratman is, in the meantime, most kindly giving his spare time to instructing. The new slotted wing "Moth" is in full use, and going well.

HAMPSHIRE AEROPLANE CLUB

REPORT for week ending July 13.—Total flying time, 72 hrs. 50 mins. Dual instruction, 33 hrs. 35 mins. "A" Pilots, 23 hrs. 55 min. Solo, 9 hrs. 40 mins. Passenger flights, 3 hrs. 5 mins. Tests, 2 hrs. 35 mins.

Instruction with Flt.-Lieut. Swoffer and Mr. W. H. Dudley:—Messrs. Wills, Michlemore, Scott-Hall, Nash, Westlake, Major Jenkins, Goldman, R. King, Beagley, Dr. Russell, Tobutt, Dalrymple-Smith, Hoare, Larden, Wells, Miss Melville, Berney, Miss Grace, Craske, Colls, H King, Mrs. King, Brewster, Nuthall, Dr. Bowden, Cator, Reuther, Grahame-Gibbs, Comm. R. Hunt, Gillett, Doxat, Turner, Agar, Whittle, Puttock, Sturge, Hall, Mariner, Donner, Phillimore, Bradyll Johnson, Mandeville, Walker, Mole, Comm. Coveney Buckley.

"A" Pilots:—Capt. Kirby, Mr. Collier, Miss Grace, Hayter, Mellor, Rayson, Leech, Parker, Bowen, Larden, Flt.-Lieut. Crawford, Ranald.

Soloists:—Mr. Tillard, Micklemore, Perfect, Fawkes, Scott-Hall, Westlake, Hoare, Loch, Wells, Nuthall, Cooper, Whittle, H. King, Southey.

Passengers: Mrs. Grahame-Gibbs, Mr. Lawrence, Mrs. Mussard, Master Mussard, Mrs. Rayson, Mrs. Swoffer, Hardy, Hewlett, Coe, Dawson, Miss Roake, Marsh, Robertson, Livingston, Fletcher, Lanham Southon, Martin, W. W. Martin, T. Woods, Mondon.

The weather forecaster did not like our remarks last week, and has shown us what he can do when he likes. Consequently we have broken another record with a weekly total of 72 hrs. 50 mins. Owing to the increased membership, and the growing success of the Bournemouth movement, we have secured the services of an Assistant Instructor, Mr. W. H. Dudley. He joined the R.N.A.S. in 1917, and graduated as a pilot at No. 4 F.T.S. in Egypt.

In 1924, he went through the course at the Central Flying School, Upavon. He then instructed at No. 5 F.T.S. at Sealands, and was afterwards posted to No. 43 Sqdn., at Tangmere, where he flew "Gamecocks" and "Siskins."

Our Chief Instructor, Flt.-Lieut. Swoffer, is now able to see what an aeroplane looks like in the sky, instead of being in one all day.

The Bournemouth movement is going very strong, and the Chief Instructor gave over seven hours' dual there last Wednesday.

Unfortunately, the Racecourse has been closed down, and so we were unable to use it. The members have secured another field, which, when the fences are removed, will make an excellent aerodrome.

Mr. H. King successfully completed his flying tests for his "A" Licence this week, bringing our total of "A" licensed members up to 39. Mr. Fawkes decided it was time he did the same, as he was one of our early members. Having completed his tests, he will not mind waiting as long for his licence, which we expect he will have to do.

We hope to have our third machine out again this week, after its accident with Mr. Watson.

The ground engineer is to be complimented on his work during the past few weeks, in getting all the machines serviceable again.

MIDLAND AERO CLUB LIMITED

REPORT for week ending July 14, :—Total flying time was 42 hrs. 49 mins. Dual, 21 hrs. 34 mins. Solo, 12 hrs. 15 mins. Passenger, 8 hrs. 4 mins. Test, 56 mins.

Dual Instruction (by F./Lt. Rose, D.F.C., and Mr. Sutcliffe): R. G. Welch, R. C. Baxter, J. Cobb, G. E. C. Hill, H. J. Lattey, O. L. Richards, G. P. Haylock, S. Duckitt W. M. Morris, S. G. Hall, W. Westwood, M. Turner, K. W. Symington, H. Coleman, A. E. Coltman, H. Beamish, Major Thomson, H. Tipper, L. V. Mann, F. J. Steward, J. B. Briggs, D. W. G. Tilleke, E. D. Wynn, T. H. Drury, S. H. Smith, Capt. Tower, G. C. Jones, M. A. Mutagh, C. H. Downing, Capt. J. C. Chaytor.

Solo: E. P. Lane, A. Ellison, R. D. Bednell, C. W. Fellowes, R. L. Jackson, S. H. Smith, H. J. Lattey, O. L. Richards, H. Tipper, W. Swan, G. Robson, G. E. C. Hill, J. Rowley, R. C. Baxter, E. J. Brighton, S. G. Hall, H. J. Willis, J. Cobb, S. Duckitt, C. H. Downing.

Passengers: Dr. Johnson, T. Ellison, B. H. McCormack, M. Turner, J. E. Hunking, J. F. Hicks, B. Cheston, J. Bant, N. Greathead, W. Westwood, D. W. Bruton, E. Russell, J. R. Guthrie, C. Eckersley, C. G. Cubitt, V. Burt.

On Thursday Mr. J. Cobb successfully made his first solo flight.

NEWCASTLE-UPON-TYNE AERO CLUB

REPORT for week ending July 15:—Total flying time, 48 hrs. 5 mins. Dual, 8 hrs. 10 mins. Solo, 5 mins. "A" Pilots: 26 hrs. 15 mins. Passengers, 11 hrs. 40 mins. Tests: 30 mins. Exhibition: 1 hrs. 25 mins.

Instruction (with Mr. J. D. Parkinson): Mrs. Robson, Mrs. Kish, Miss Klyvver, Miss Slade, Messrs. Carr, Alton, De Pledge, Runciman, Lawson, Lawrence, Walker, Temple, Horn.

Solo:—Miss Slade.

"A" Pilots: Dr. Dixon, Messrs. Turnbull, Todd, H. Ellis, Heppell, Wilson, De Pledge, Runciman, R. N. Thompson, A. H. Bell, Irving, C. Thompson, Horn, Percy, Phillips, Miss C. R. Leathart, Mrs. Heslop.

We are pleased to report that Miss Slade was successfully launched this week. Her performance was excellent, and shows promise of a good pilot.

NORFOLK & NORWICH AERO CLUB

REPORT for week ending July 15:—Total flying time, 32 hrs. 40 mins.

Instruction (with Mr. Young): Messrs. C. Harvey, T. Image, C. Ransome, G. Wharton, C. Bethell, A. Richardson, W. S. Coates, C. Meadows, A. J. Finch.

Soloists: Messrs. H. P. Clarke, T. Image, A. Marshall, F. Gough, E. Varden Smith, A. Cooper, R. Moore, N. Brett, R. Potter, W. Cubitt, W. Ramsay, G. Surtees. Passengers, 82.

On Thursday this week a great many people from Thetford were taken up for joy rides on their aerodrome at Euston Road, among the prominent people carried was the Mayor of Thetford who expressed his delight. On Saturday members of the Norfolk County Council were invited to take tea at the Club and many of them were taken for a flight over Norwich. It was a pleasure to have with us on this occasion Mr. Henry N. Holmes, who has recently honoured the club by becoming its first president. Capt. Rice, our chairman, received the visitors. We were distinctly pleased the chairman of the County Council (Mr. Russel Colman) was present.

SUFFOLK AND EASTERN COUNTIES AEROPLANE CLUB

REPORT for week ending July 14:—Flying time, 29 hrs. 20 mins. Instruction: 9 hrs. 20 mins. "A" and "B" pilots: 11 hrs. 15 mins. Solo (under instruction): 2 hrs. 40 mins. Tests, 25 mins. Instruction (with Mr. Lowdell): Mrs. Young, Miss Rhodes, Dr. Mildred Yate, Miss W. Edwards, Messrs. Goodwin, B. F. Marriage, Hanson, Wedd, Croydon and P./O. Creasey.

Solo (under instruction): Miss S. Edwards, Messrs. Billington, Hanson and P./O. Creasey.

"A" and "B" pilots: Mr. C. N. Prentice, Dr. J. C. Sleigh, Messrs. Schofield, Brown, Verney, and F./O. Birt.

Passengers (with Mr. Lowdell): 26, with Mr. Prentice, 21.

Mr. H. Billington and Mr. C. Hanson both completed their tests for their "A" licence in good style during the week.

The weather has been perfect and in addition to a very busy week at Hadleigh we joined the Norfolk and Norwich Aero Club in a crusade to create "airmindedness" at Thetford on Thursday. Whether we achieved our object or not the members of the two clubs present had great fun.

FROM THE FLYING SCHOOLS

The De Havilland Flying School, Stag Lane Aerodrome

REPORT for week ending July 15:—Total flying time, 279 hrs. 15 mins. Instruction: Dual, 121 hrs.; solo, 131 hrs. Other flying, 27 hrs. 15 mins.

This week has seen the school working at high pressure, and all our previous records have been easily surpassed with the huge total of 279 hrs. 15 mins. flying for one week. Truly a blazing example of the ever-increasing popularity of civil aviation, coupled with light aeroplanes.

Besides a record number of hours being flown, seven pupils carried out excellent first solos, one pupil passed tests for "A" licence and another tests for "B" licence. This constitutes yet another record for a single aviation school.

Nine new "Moths" were tested and the famous "Tiger-Moth" was again "rocketed" into the atmosphere by Capt. Broad after its long period of inactivity.

Notable visitors this week were our old friends Sir Alan and Lady Cobham, looking very fit after their successful African tour. Sir Alan flew a school "Moth" with very obvious enjoyment.

On Saturday last the school was closed for the firm's sports meeting, but instructors and "Moths" would not then be denied, for one of the most popular events in the programme was a flying obstacle race, admirably planned by Capt. A. S. White, our chief instructor.

Henderson Flying School, Brooklands Aerodrome

REPORT for week ending July 15.—Total flying time, 48 hrs. 10 mins. Dual: (with Col. G. L. P. Henderson) Mr. Du Cane, Miss Fernie; (with Capt. H. D. Davis) Messrs. Swan, Hill, Presland, Dr. Wall, Mayos, Murphy, Du Cane, Dr. Taylor, Daniels, Oliver, Crabtree, Davies, Misses Wellby, Chapman, Fernie; (with Capt. W. F. Davenport) Miss Wellby, Messrs. Maddocks, Du Cane, Davies, Egston, Bingham.

Mr. Swan made an exceptionally good first solo on the 12th inst.

The total number of passengers carried during the week numbered 320.

Mr. Crabtree and Oliver, in doing their night-flying tests at Croydon, have now completed all tests for their "B" licence. We have now turned out five "B" licence pilots since January 1.

AIRISMS FROM THE FOUR WINDS

Italian Polar Expedition

WHEN the *Italia* airship crashed off North-East Land on May 24 after the flight to the North Pole, it will be remembered that Gen. Nobile and several of his crew were stranded on the ice with the damaged gondola. The others drifted away in the airship. They have never been heard of since. Three of Gen. Nobile's party—namely, Dr. Malmgren (a Swede), Maj. Mariano, and Maj. Zappi (Italians)—decided, against the wish of the General, to try and reach land, for they did not believe that wireless communication with the outside world would ever be made effectively. For six weeks they disappeared. Meanwhile Gen. Nobile was rescued by air. Then, on July 12, the Russian pilot, M. Chuknovsky, sighted the walking party and informed the Soviet ice-breaker *Krassin*, which immediately steamed to the spot off Broach Island and found Majs. Zappi and Mariano. The Swede, Dr. Malmgren, they said, had died a month before from hardship and exposure, after urging them to go on and take what food was left, as he knew he could not survive long. Continuing a course eastward, the *Krassin* next rescued the remainder of Gen. Nobile's party, which was under Lieut. Viglieri. Amongst them was Signor Ceccioni, the engineer, who was seriously ill. In all previous reports he was stated to have died. Also Capt. Soro and party, who had set out to search for the walking party, were picked up. The pilot, Chuknovsky, after sighting and reporting the walking party, which led to their rescue, made a forced landing, with damage to his machine, at Cape Platen whilst trying to reach the *Krassin* again. He and his companions have food for 15 days and wireless apparatus. They are considered to be in no great danger, and will be picked up by the *Krassin* on its return. Of Capt. Amundsen, Maj. Guilbaud and companions, who set off from Tromsoe in the Latham flying-boat on June 18, no authentic report has come through. It is suggested they are with the group which drifted with the airship under Signor Alessandrini. A possible position of this group has been given, and Gen. Nobile has begged the *Krassin* to search. The ship proposes to do so after taking in coaling supplies at Advent Bay. It also hopes to recover the body of Dr. Malmgren. Prof. Behounek, one of those saved with Viglieri's group, is reported to have said that he considers the disaster to the airship was caused through the desire to explore the tract south-east of the North Pole. This ran the ship into a storm and wrecked it. It remained over the North Pole for two hours at an altitude of 450 ft. The Italian survivors will shortly be brought home by the *Citta di Milano*, the supply ship, which will then return to Spitzbergen.

French European Tour

LIEUT. LASSALLE and Adjutant Duroyon completed on July 12 a series of flights between Paris and several European capitals. They began on July 7. They flew to Oslo and back in two days, and to Madrid, Warsaw, Rome, and Lisbon and back, each in one day. Altogether 6,250 miles were flown. The machine was a Potez 25.A.2 biplane fitted with a 450-h.p. Lorraine-Dietrich geared engine.

Round the World Attempt

MR. MIERS and Mr. Collier, the two American airmen who are attempting to travel round the world in 23 days, reached Tokyo on July 11, after flying from Mukden in 15¾ hours. They were due to leave for Canada by ship the following day.

Italian Long-Distance Airmen to Resume

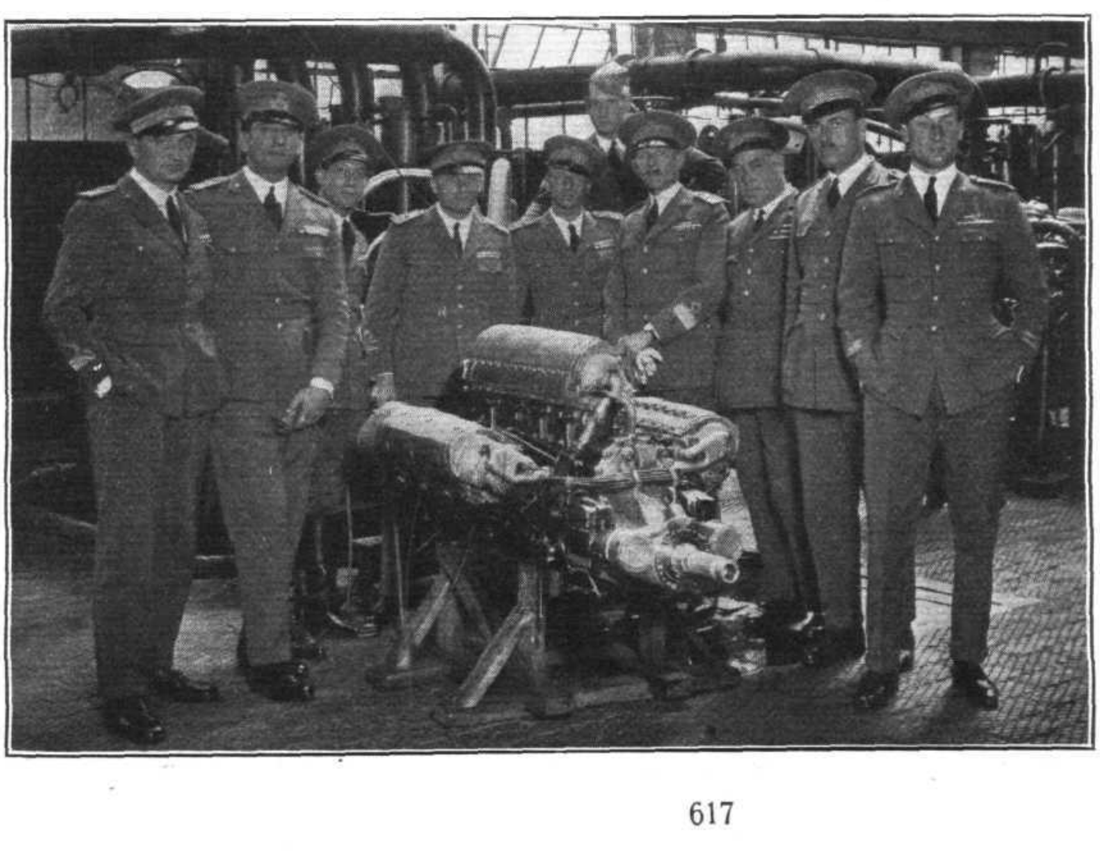
CAPT. FERRARIN and Major Del Prete, who recently broke the long-distance record with their non-stop flight across the South Atlantic from Rome to Brazil, are preparing for an early resumption of their flight to Rio de Janeiro.

The "Bremen"

A DETACHMENT of the Quebec Provincial Police is to be sent to Greenly Island, Labrador, to protect the aeroplane *Bremen*, which had to be abandoned by the Atlantic airmen, Baron Von Heuneveld, Capt. Koehl and Major Fitzmaurice, after they landed there at the end of their Atlantic flight. The protection is required as damage is being done by souvenir hunters.

Via Greenland

A NEW flight from America to Europe will be essayed shortly when Mr. Bert Hassell, an Illinois pilot, and Mr. Parke-Cramer, a fellow pilot, will leave Rockford, Illinois, in a large Stinson-Detroit monoplane, fitted with a Wright "Whirlwind" engine, for Stockholm. They will fly via Greenland and stop at Mount Evans Observatory to re-fuel. The total distance is 4,283 miles. A fund of £5,000 was raised by popular subscription in Rockford, under the auspices of the Chamber of Commerce. Stockholm is chosen as the destination, as Mr. Hassell is of Swedish descent, and 40 per



Italian Air Force Officers at Napiers: Some of the Officers of the Royal Italian Air Force, who flew to England to see the R.A.F. Display, also paid a visit to the Napier Works at Acton. The group in our picture (inspecting one of the 900-h.p. Schneider Trophy "Lions") include (from left to right)—Maj. Lordi, Maj. Martelli, Lieut.-Col. Fouguez, Gen. Lombard, Lieut.-Col. Binda, Lieut.-Col. Aimone, Lieut.-Col. Ranza, Col. Bolognesi, and Capt. Guazzetti.

cent. of the population of Rockford is Scandinavian. The stage to be flown is regarded favourably by business men and airmen in America as having distinct commercial possibilities, for there are only three short sea stretches to be crossed.

Mexican "Ace" Killed

CAPT. EMILIE CARRANZA, the Mexican pilot, who has recently been attempting long distance flights from his country to America, was found dead in a wood on July 13 with his wrecked machine. He had left New York shortly before with the intention of flying non-stop to Mexico City. It is stated that his machine was struck by lightning. President Coolidge immediately sent a message of sympathy to President Calles in Mexico, expressing the grief of the American nation. He also offered to despatch the battleship, Florida, to convey the body of Carranza back to Mexico.

Western Canada Airway's Large Fleet

WESTERN CANADA AIRWAYS, LTD., recently placed an order with the Atlantic Aircraft Corp. of New Jersey, for eight commercial aircraft, the delivery of which will bring up the number of their fleet to a total of 31 aeroplanes, all in operation in the province of Manitoba. The new consignment will consist of several Fokker-Super-Universals and Standard Universals, and a Fokker Trimotor 10-passenger machine. Mr. W. E. Brintnell, W.C.A.'s operating manager, states that the Company's machines last winter carried 1,428 passengers, 185,000 lbs. of express and 10,000 lbs. of mail, covering 101,000 miles, all with skis for take-off and landing under winter conditions. What a pity our own aircraft constructors cannot supply the machines for this, and similar work!

Sir John Salmond

ON July 16 Air Vice-Marshal Sir John Salmond, who is on an official visit to Australia, inspected the Sydney Aero Club and the naval depot at Garden Island.

Gliding the Channel

HERR HANS RICHTER has built a particularly light glider with which it is reported that he proposes to glide the English Channel from Calais to Dover.

Twenty Years Ago!

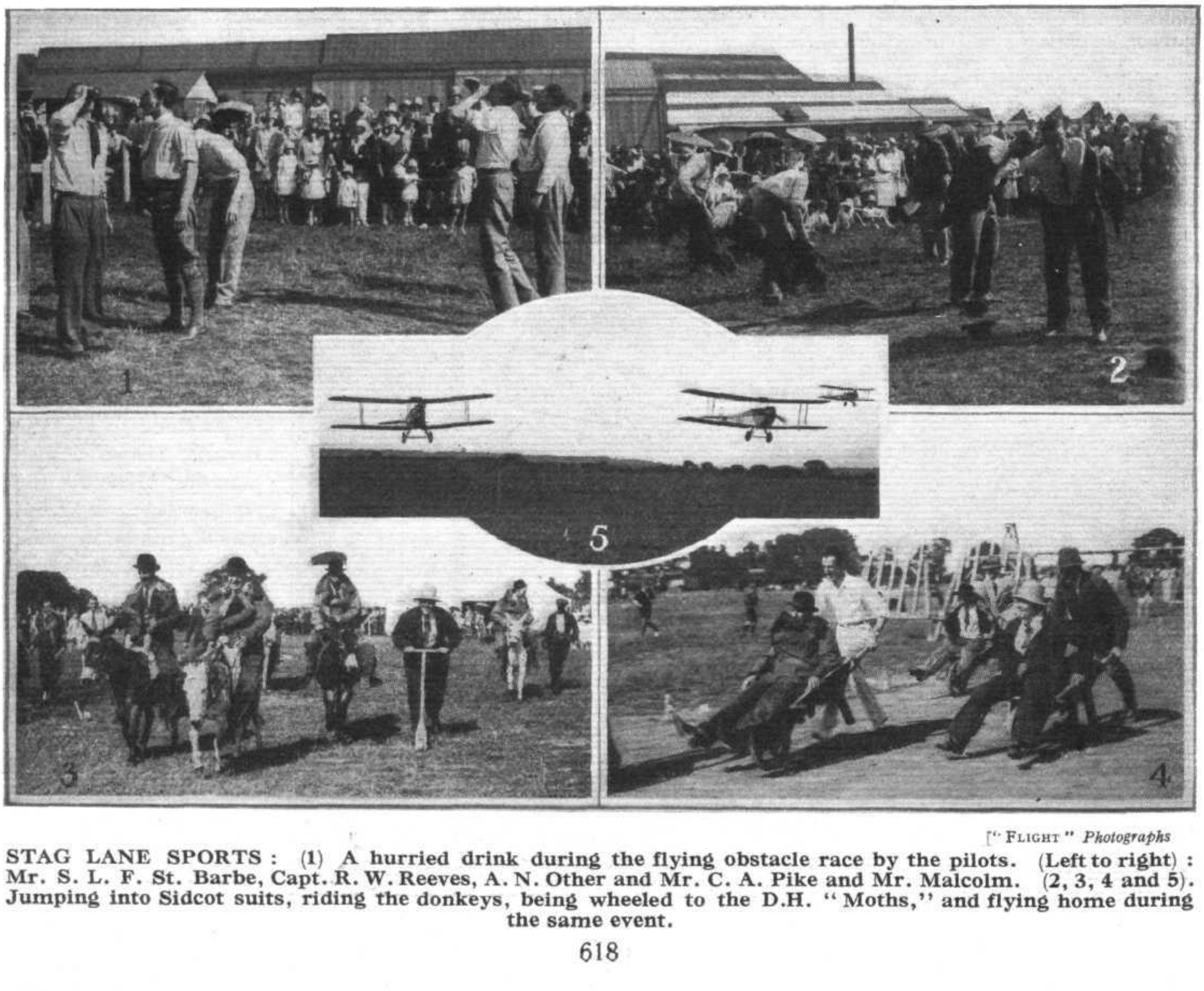
Extract from the "Auto." (Precursor of "Flight"), July 18, 1908.

"*M. Delagrange at Turin.*—During his visit to Turin M. Delagrange has made some more very satisfactory experiments with his aeroplane, and on one occasion last week executed a passenger flight with Mme. Therese Peltier on board. The journey was certainly only 150 metres in length, but for carrying a lady passenger on board even this is a record. . . .

"*The Curtiss Aeroplane.*—It is reported from New York that Mr. Glenn Curtiss succeeded in flying a distance of 1,093 yards in 1 min. 15 secs. before several thousand spectators at Hammondsport, New York, on Saturday, July 4th and thereby won a trophy for making the first officially-observed test."

DE HAVILLAND ANNUAL SPORTS

THE De Havilland Sports Club held its annual sports meeting on July 14 at Stag Lane Aerodrome. Despite the possible counter attraction at the Welsh Harp close by, where flying also played a part in the events, there was quite a large gathering at Stag Lane, and in glorious weather an interesting afternoon and evening was spent. Perhaps the most amusing item was the flying obstacle race, in which well-known De Havilland pilots engaged. First they ran for fifty yards, drank a bottle of beer each, hurried into Sidcot suits, cycled a stretch, rode donkeys, and were finally wheeled in barrows to the row of waiting D.H. "Moths," which were already started up. The pilots clambered in and flew two circuits of the district, covering about eighteen miles. There was an excellent finish over the sports ground, nearly all machines being in a group. No attempt was made to pick a winner. Some machines carried passengers who had gained



["FLIGHT" Photographs

STAG LANE SPORTS: (1) A hurried drink during the flying obstacle race by the pilots. (Left to right): Mr. S. L. F. St. Barbe, Capt. R. W. Reeves, A. N. Other and Mr. C. A. Pike and Mr. Malcolm. (2, 3, 4 and 5). Jumping into Sidcot suits, riding the donkeys, being wheeled to the D.H. "Moths," and flying home during the same event.

[" Flight " Photographs

DE HAVILLAND SPORTS CLUB MEETING: (1) Officials and competitors at the De Havilland sports held at Stag Lane on July 14. (Left to Right): Capt. H. Broad, Capt. G. de Havilland, Mr. Malcolm, Mr. G. H. Allison, Mr. A. T. Groombridge, Mr. O. W. H. Cooke, Mr. F. E. N. St. Barbe, Mr. S. L. F. St. Barbe, Capt. C. C. Walker and Capt. A. S. White. (2) Miss Smith winning the Ladies' High Jump. (3) Final of the 220 Yards. (4) Zig-zagging the hurdles during the motor-cycling racing. (5) Mr. Campkin standing still and thereby winning the Slow Cycle Race.

he privilege by possessing programmes with chosen numbers. The pilots were Capt. A. S. White, Capt. Allison, Mr. C. A. Pike, Mr. Malcolm, Mr. S. L. F. St. Barbe and Capt. R. W. Reeves.

Another humorous event was the elopement race, in which men competitors raced each other towards a row of young ladies, picked them up and raced back with their human loads. Mr. G. de Havilland (Junior) won, carrying Mrs. Watson.

A motor cycle grass track race produced thrills. Competitors tore round a track, threading their way between hurdles halfway. The winner was Mr. Buckingham on a Zenith J.A.P., and the second man was Mr. Erlham on a Cotton-Blackburn. The first and second positions in a sack race went to Mr. Shaw and Mr. Bonnick, and to Miss Smith and Miss Benn in a Ladies High Jump. The D.H. Steeplechase was won by Capt. R. W. Reeves, with Mr. Clarkson and Mr. Harris in the other positions. The result of the 440 yards race was (1) Mr. Mott; (2) Mr. Benn; and (3) Mr. Tyler; whilst the 100 yards final went to (1) Mr. Mott; (2) Mr. Amos; and (3) Mr. Bicknell. Throwing the cricket ball event: (1) Mr. H. F. Smith; (2) Mr. A. L. Smith; and (3) Mr. H. E. Dockerill. In the 100 yards final (under 17) the result was (1) Mr. Kimpton; (2) Mr. Hammond; and (3) Mr. Thomas. Veterans' Race: (1) Mr. Roedling; (2) Mr. Cook; and (3) Mr. De-Ath. The High Jump was won by Mr. Rae (4 ft. 11 ins.), and for second position Mr. Hardingham and Mr. Rogers tied at 4 ft. 10 ins. Mr. Campkin won an amusing slow cycle race from Mr. Rae, by balancing himself in one position a short distance along the course and remaining there whilst his competitor wobbled through to the end. The 100 yards Ladies (under 21) event was won by Miss Duffey. Miss Woodell and Miss Cox were second and third respectively.

Capt. H. S. Broad gave a demonstration on a D.H. "Moth." The 220 yards final went to (1) Mr. Hardingham; (2) Mr. Bicknell; and (3) Mr. McGregor. Long Jump: (1) Mr. Hardingham; (2) Mr. Rogers; (3) Mr. Kimpton. One Mile: (1) Mr. Basan; (2) Mr. Dobner; and (3) Mr. J. Clarke. Miss Duffey and Mr. Morley won the mixed three-legged race, and Miss Walker was first and Miss Smith second in the Ladies Open 100 yards race. An obstacle race went to Mr. Brennan; and (2) Mr. Kirke.

The Engine Shop A won the one-mile relay race, and the "Moth" shop was second.

One Mile Invitation Relay Race: The Standard Telephones and Cables Athletic Club was first and The Daimler Sports Club second.

There were many children's races. In the event for those under eleven years, the winners in the girls were (1) M. Abel; (2) B. Eagle; (3) M. Gow. Result of boys' race: Masters Strong, Kirke and Knightley. Miss Sparrow won in the race for those under fourteen, and Master Strong the boys' event. Miss Eagle and Master Kerk won the races for those under nine, and Master Thomas obtained the under fourteen class event.

The Engine Shop gained most points during the meeting and therefore won the De Havilland Challenge Cup for the year. The office staff obtained the next highest number of points and won the "Aussie" Cup, presented by the de Havilland Aircraft (Pty.), Ltd.

Capt. G. de Havilland, Mr. F. T. Hearle, Mr. F. E. N. St. Barbe, and Capt. C. C. Walker helped to control events.

Music was given by the Edgware Excelsior Band.

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Royal Air Force Memorial Fund

The usual meeting of the Grants Sub-Committee of the Fund was held at Iddesleigh House on July 12. Lieut.-Commander H. E. Perrin was in the chair, and the other members of the Committee present were:—Mr. W. S. Field and Sqdn.-Leader Douglas Iron, O.B.E. The Committee considered in all 19 cases, and made grants to the amount of £349. The next meeting was fixed for July 26, at 2.30 p.m.

PARIS AERO SHOW

(Concluded from page 614)

of rectangular section, running fore and aft, above the torpedo. No heating apparatus was to be seen on the machine as exhibited, but, doubtless, this was due to official restrictions.

The undercarriage is of the "droppable" type, the details being illustrated by sketches. The telescopic leg is provided, at its upper end, with a species of bayonet joint, which is under the control of the pilot. When this is released, the wheel and telescopic leg fall downwards under their combined weight. The axle and radius rod, fitting into forked lugs on the fuselage, are free to fall when the wheel has reached a certain position, and the whole undercarriage is then released.

In other respects the Levasseur is a normal machine with biplane wing arrangement. One unusual feature is the arrangement of the petrol tanks as wing roots on the lower plane. Apart from giving extra room in the fuselage, this arrangement probably affords a certain amount of extra flotation, the position being slightly outboard and the jettisoning of the fuel being relatively easily accomplished. The empty tanks are not, however, relied upon for lateral stability on the water, wing floats being provided for this purpose. The machine, like all P. Levasseur types, is pleasing to English eyes, possibly because, except for certain of its more unusual features, it might well have been designed and built in this country.

Following are the main dimensions of the Levasseur torpedoplane: length, o.a., 11·7 m (38 ft. 5 in.); wing span (top), 18 m. (59 ft.); wing span (bottom), 13·6 m. (44 ft. 7 in.) wing area, 77·5 m.^{2} (835 sq. ft.). The total loaded weight is 3,650 kg. (8,030 lb.) and the useful load 1,000 kg. (2,200 lb.) No performance figures are available.

The Henry Potez 35

Marking a departure from normal practice, the Potez 35 is that unusual type of aircraft: a high-wing monoplane night bomber. At least, it is equipped, at the Show, with searchlights in the nose, navigation lights, etc., although the official designation of the machine is a "*Multiplace (Grande Reconnaissance, Combat et Bombardement)*". We have not, perhaps, in this country the exact counterpart of this class of machine, but for all that, the Potez 35 is worth a study. Constructionally, it follows normal Potez practice, which is a mixed construction unaffected by the modern demand for all-metal machines. The Potez firm, one of the soundest in France and if anything, a little conservative, does not see the need yet for all-metal aircraft, and points to the ease of maintenance and repairs which the older mixed construction affords.

Two main objects were kept prominently in mind in designing the Potez 35: A prolific armament which should leave practically no "blind spots," and comfort for the crew in carrying out such of the machine's functions as require a certain amount of delicate work. To that end the machine was designed as a high-wing monoplane, with a roomy cabin and an unusual placing of defensive armament. The latter takes the form of 5 machine guns, of which one is placed on a swivelling mounting in the roof over the pilot's cockpit. This gun covers a cone bounded on the sides by the propeller discs and in front by the nose of the fuselage. In the roof of the latter, aft of the wing, is another gunner's post, with two machine guns mounted on the usual gun ring. Yet another two machine guns are mounted in the floor, and cover such, already very few, "blind spots" as are outside the range of the other guns.

The offensive armament consists of bombs, and the large cabin space enables these to be carried in a vertical position internally in the fuselage, where they are out of the wind, and thus offer no extra resistance. Ten of these bombs are carried, each weighing up to 50 kgs. (110 lb.). The cabin equipment includes the usual navigation and lighting instruments, and also camera for taking vertical and oblique photographs, as well as two wireless sets, one for receiving and one for transmitting. The engine nacelles are carried outboard between the wing and the lift struts. The specimen exhibited had two geared Renault engines of 480 h.p. each, but as the engine nacelles are complete units, secured to the aircraft structure by but three fittings, an engine can be changed very quickly, and, if desired, engines of a different type substituted. The petrol tanks, of which there are two, each with a capacity of 350 litres (77 gallons), are housed in the wing, and the oil tanks are built to form the leading edge of the wing, above each engine, so as to provide oil cooling at the same time.

The main characteristics of the Potez 35 are as follows:— Length, overall, 12·8 m. (42 ft.); wing span, 19·2 m. (63 ft.); wing area, 63 m^2. (678 sq. ft.). Weight empty, but including water, 2,130 kg. (4,680 lb.); fuel and oil, 520 kg. (1,145 lb.); useful load, 800 kg. (1,760 lb.); total loaded weight, 3,450 kg. (7,585 lb.). Speed at ground level, 242 km./hr. (150 m.p.h.); speed at 3,500 m. (11,480 ft.), 230 km./hr. (143 m.p.h.). Service ceiling, 7,000 m. (22,950 ft.).

(To be concluded.)

IN PARLIAMENT

R.A.F. Sergeant-Pilots

MR. HORE-BELISHA, on July 5, asked the Secretary of State for Air whether, seeing that sergeant-pilots after five years' flying service are placed on the reserve list of pilots, he will state what means are taken to keep them efficient as pilots?

Sir Philip Sassoon: The Commanding Officer of an airman who has reverted to trade employment after five years' service as a pilot is responsible that the airman maintains himself in regular flying practice and carries out as much flying as possible, and in any case not less than three hours flying each quarter. Airmen who carry out the prescribed minimum and are certified as competent pilots are eligible for a bounty at the rate of £10 a year.

Mr. Hore-Belisha asked, in view of the Air Ministry advertisements, how many commissions are to be granted to sergeant-pilots before their five years' flying time has expired; and what is the number of commissions designated and the number granted for 1928?

Sir P. Sassoon: As regards the first part of the question, the number of permanent commissions to be granted to airmen pilots depends upon the requirements of the service and the suitability of the candidates recommended. The number will vary, therefore, from time to time, and is not subject to any arbitrary limit. As regards the second part, no such commissions have been granted so far during 1928; recommendations are to be considered in October next, but I cannot say how many (if any) will then be granted.

Mr. Hore-Belisha asked the Secretary of State for Air if he is satisfied with the present system of reverting sergeant-pilots, after five years' flying service, to their previous rank, status, and pay; if he has received from official or other sources information disclosing discontent among the ranks affected?

Sir P. Sassoon: When a sergeant-pilot reverts to his former trade employment on completion of five years' flying service, he retains the rank of sergeant and receives the pay of that rank, but not, of course, the additional pay as pilot. He receives, however, a bounty of £10 a year conditional upon his continuing in flying practice. I have no reason to regard this arrangement as unsatisfactory. As regards the second part of the question, the rule that airmen pilots must revert to trade employment after five years' flying service has been obligatory since January 1, 1927, and all men who have commenced training as pilots since that date have volunteered on that understanding. The rule is necessary in order to maintain the reserve. Airmen who commenced training as pilots before that date were offered the option of continuing under the old system or coming under the new rule and the majority chose the latter alternative. I am not aware of any discontent, and do not see on what grounds it could exist.

Municipal Aerodromes

SIR R. THOMAS asked how many, and which, local authorities have yet established, or have formulated definite schemes for establishing, municipal landing grounds for civil aircraft; what municipalities have approached his Department for expert advice or financial assistance in the acquisition of sites; does he extend such financial help where necessary; and, if so, how much has been expended up to the present in this manner?

Sir S. Hoare: There is in existence no municipal aerodrome or landing-ground, but a definite scheme for an aerodrome has been formulated by the Corporation of Blackpool. In addition to Blackpool, the following municipalities have asked for expert advice: Bognor, Bristol, Chester, Leeds, Leicester, Littlehampton, Morecambe, Portsmouth, Scarborough, Skegness and Worthing. Financial assistance has not been specifically requested and could not in any case be given from public funds. The only expenditure falling on the Air Ministry has been in respect of the travelling expenses of officials who have visited the proposed sites. I may add that, in addition to the municipalities above mentioned, Glasgow, Liverpool, Manchester and Plymouth are understood to have the question of establishing municipal aerodromes under consideration.

The Prince of Wales

ON July 18, H.R.H. The Prince of Wales had once again arranged to fly in order to keep his engagements. He was due to leave Northolt Aerodrome at 5 p.m. and fly direct to Brocklesby Park, Lincolnshire, the seat of Lord Yarborough, where he will stay before keeping an appointment in Grimsby.

Aviation in Schools

SIR SAMUEL HOARE will formally open a new science wing at Highgate School on July 21, which has been completed at a cost of over £60,000. The equipment includes a large hangar on the roof of the buildings, Avro and Snipe aeroplanes, an Armstrong Siddeley "Jaguar" engine, and a 450 h.p. Napier "Lion" engine. The object of the school is to provide opportunity for the study of flight. Actual flying is not at the moment contemplated.

Growing Quickly

THE new Liverpool and District Aero Club has now two Avro "Avians." and Lieut. R. R. Bentley, as instructor *pro tem.*

THE ROYAL AIR FORCE

London Gazette, July 10, 1928.

General Duties Branch

The following are granted short-service commns. as Pilot Officers on probation, with effect from and with seniority of, June 29:—J. R. Ayling, T. F. Balfour, R. L. Bennet, A. K. H. Binley, J. H. Brown, R. J. C. Hunt, J. C. L. Claxton, A. G. Cole (Lieut. 7th Middx. Regt., T.A.), R. H. Coupe, S. A. Davis, F. C. E. Hayter, R. C. W. Ellison, W. C. Garrett-Petts, D. L. Iremonger, J. M. Israel, E. G. James, G. W. J. Jarrett, G. R. O'C. Lempriere, C. N. McLoughlin, J. G. Riess (2nd Lieut. 20th Lond. Regt., T.A.), J. D. Robertson, H. E. Sales, I. M. Smith, R. H. Spurrier, W. G. Stevenson, K. G. Vandyck, F. K. Wood.

Lieut. H. N. M. Nangle, R.N., is granted a temp. commn. as Flying Officer on attachment for duty with R.A.F. (June 28); Pilot Officer on probation J. Barton is confirmed in rank (June 15); Sqdn. Ldr. C. J. W. Darwin, D.S.O., is placed on retired list at his own request (July 1); Flying Officer J. S. Dick is transferred to Reserve. Class A (June 30).

The following resign their short-service commns:—Flying Officer (Hon. Flight-Lieut.) (Capt. Rif. Bde., R.A.R.O.), D. S. Cairnes (July 8); Pilot Officer on probation F. D. Dawson (June 28); Pilot Officer on probation F. J. Sarsfield-Sampson (June 29). The short-service commn. of Pilot Officer on probation B. P. Silk is terminated on cessation of duty (July 7). Flying Officer M. W. J. Boxall is dismissed the Service by sentence of General Court Martial (June 25).

Stores Branch

Sqdn.-Ldr F. H. Songhurst, M.B.E., is placed on retired list on account of ill-health (July 11).

Medical Branch

Flying Officer F. A. O'Connor, M.B., resigns his short-service commn. (June 30).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

Flying Officer (Hon. Flt.-Lieut.) (Capt. Rif. Bde., R.A.R.O.) D. S. Cairnes is granted a commn., in Class A (July 8); H. Marsden is granted a commn. in Class A as Flying Officer (July 10). The following are granted commns. in Class A.A. (ii) as Pilot Officers on probation:—R. Harston, L. F. Hooper, E. M. King, P. L. D. Teichman-Derville (June 25).

Gazette Jan. 27 concerning Flying Officer H. S. Eaton is cancelled.

AUXILIARY AIR FORCE

General Duties Branch

No 600 City of London (Bombing) Sqdn.—The following Pilot Officer to be Flying Officer:—T. Courtis (May 9). No. 602 City of Glasgow (Bombing) Squadron.—The following to be Pilot Officer:—D. H. Back (May 21).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commanders: A. T. Whitelock to R.A.F. Depot, Uxbridge, for administrative duties. 18.6.28. E. R. L. Corballis, D.S.O., O.B.E., to No. 23 Group H.Q., Grantham, for Air Staff duties. 15.6.28.

Flight Lieutenant N. H. Jenkins, O.B.E., D.F.C., D.S.M., to No. 22 Sqdn., Martlesham Heath. 1.6.28.

Flying Officers: J. St. C. Arbuthnott to No. 39 Sqdn., Bircham Newton. 14.6.28. A. W. Elias to Home Aircraft Depot, Henlow. 18.6.28. A. P. Bett to H.Q., Wessex Bombing Area, Andover. 1.8.28. H. W. Taylor to No. 3 Sqdn., Upavon, instead of to Armament and Gunnery Sch., Eastchurch, as previously notified. 11.6.28. J. V. Yonge to Armament and Gunnery Sch., Eastchurch, instead of to No. 3 Sqdn., Upavon, as previously notified. 11.6.28.

Pilot Officers: J. F. Griffiths to No. 28 Sqdn., India. 25.5.28. A. R. Combe to No. 45 Sqdn., Middle East. 3.6.28. G. E. E. Singleton to No. 45 Sqdn., Middle East, 10.6.28. L. M. Woolveridge to No. 216 Sqdn., Middle East. 3.6.28.

Stores Branch

Flying Officers: R. H. Clay to H.Q., Iraq Command. 22.5.28. A. M. Reidy to No. 2 Stores Depot, Altrincham. 14.6.28.

Accountant Branch.

Pilot Officers: H. A. Frost, M. L. Jones, C. V. Mears, T. C. Reep, and R. Trippett to H.Q., Cranwell, on appointment to Permanent Commns. 11.6.28.

Medical Branch

Wing Commander H. W. Scott, M.B., B.A., to R.A.F. Depot, Uxbridge. 2.7.28.

Squadron Leaders: R. W. Ryan, M.B., to Central Med. Estab. 12.7.28. J. T. T. Forbes to No. 3 Flying Training Sch., Grantham. 9.7.28.

Flight Lieutenant L. P. McCullagh, M.B., to R.A.F., M.T. Depot, Shrewsbury. 28.6.28.

Flying Officers: J. M. Ritchie, M.B., to H.Q., Air Defence of Great Britain, Uxbridge. 16.7.28. V. V. Brown to R.A.F. Station, Tangmere, 25.6.28. J. J. MacAndrews, M.B., to H.Q., Air Defence of Great Britain, Uxbridge, 2.7.28.

NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty:—

Lieuts. (Flying Officers, R.A.F.).—J. H. I. Wood, to *Victory*, lent to R.A.F. Base, Gosport, for full flying duties with base miscellaneous flights (June 16), amended appts. H. D. Barlow to *Courageous*, and for D.L. training in 407 Flight (June 25), and to *Eagle* and for F.F.D. in 402 Flight (on completion of D.L. training); G. L. Brinton, to *Courageous* and for D.L. training in 407 Flight (June 25), and for F.F.D. (on completion of D.L. training); C. A. Kingsley-Rowe, to *Furious* and for D.L. training in 405 Flight (undated) and for F.F.D. (on completion of D.L. training); H. W. Metcalfe, to *Argus* and for D.L. training in 401 Flight, and for F.F.D. (on completion of D.L. training); F. W. Bourne, to *Furious* and for D.L. training in 405 Flight (undated); and C. W. Byas, to *Ross* for Submarine M 2 and for full flying duties at School of Naval Co-operation, Lee-on-Solent, supy. (June 15). J. I. Robertson and E. J. E. Burt, to *Furious*, and for full flying duties in 421 Flight (on transfer of Flight).

Lieut.-Commr. (Flying Officer, R.A.F.) T. O. Bulteel, to *Argus*, and for full flying duties in 401 Flight (undated).

Lieutenant (Flight-Lieut., R.A.F.) C. J. N. Atkinson, to *Courageous*, and for full flying duties in 404 Flight (undated).

Lieuts. (Flying Officers, R.A.F.): T. H. Villiers, to *Columbine*, and for full flying duty in 406 Flight (June 14). H. Ditton, to *Cardiff*; and M. Cursham, to *Warspite* (undated); the Hon. J. M. Southwell, to *Benbow*; and R. G. Poole to *Rodney* (June 16). J. C. Richards. to *Couraegous*, and for full flying duties in 416 Flight (June 1). S. Borrett, to *Vindictive*, temp., and for full flying duties in 444 Flight (May 11); and J. H. I. Wood, to *Victory*, lent to R.A.F. Base, Gosport (June 16).

Lieutenant R. H. S. Roundell, attached to R.A.F., to join R.A.F. Base, Leuchars (June 17).

Sub-Lieuts.: P. W. Humphreys and B. H. M. Kendall, attached to R.A.F. to join R.A.F. Base, Leuchars (June 17).

Sub-Lieuts. (Flying Officers, R.A.F.): P. D. Heinemann, to *Furious* and for D.L. training in 405 Flight (undated), and to *Hermes* for F.F.D. in 403 Flight (on completion of D.L. training); W. R. Paris, to *President*, for duty with D.S.D. (Aug. 18).

Surgn. Commrs.—A. C. Shaw, M.B., to *President*, for three weeks' cours at R.A.F Medical School (Sept. 13), and to *Eagle* (Sept. 3).

SLOTTED WINGS: Two views of the Vickers "Virginia" bomber fitted with the Handley-Page slotted wings. On the left, the slots are shown closed, and on-the right, open.

PERSONALS

Married

FLIGHT-LIEUT. W. H. MARKHAM, R.A.F., only son of Mr. and Mrs. T. Markham, Marton, Lincs, was married, on June 28, at the Church of St. Wilfrid, Harrogate, to HILDA MURIEL, third daughter of Mr. and Mrs. C. E. ATKINSON, 21, York Road, Harrogate.

To be Married

An engagement is announced between FLIGHT-LIEUT. A. F. COOK, R.A.F. (Medical Service), elder son of Mr. and Mrs. C. N. Cook, of Kingstown, County Dublin, and MISS PHYLLIS MCENNERY, elder daughter of Mr. and Mrs. Lionel McEnnery, of 85, Palmerston Road, Dublin.

A marriage has been arranged and will shortly take place between GROUP. CAPTAIN WILLIAM FOSTER MAC NEECE FOSTER, C.B.E., D.S.O., D.F.C., eldest son of Colonel and Mrs. MacNeece, of Castle Cary, County Donegal, and LEAN, daughter of Mr. and Mrs. RALPH W' BRUCE, of Langtons, South Weald, Essex.

The marriage has been arranged, and will shortly take place, between FLIGHT-LIEUT. T. H. NEWTON, D.S.C., R.A.F., and IRIS, only daughter of Mrs. EVERETT GAUTE, Ingle Lodge, Addlestone.

The engagement is announced between WILLIAM BLAIR HAVERGAL SHAW, late R.A.F. and of Kenya Colony, son of the Rev. W. H. Shaw and the late Mrs. Shaw, of Barton Court, New Milton, and DOREEN M. MILLS, daughter of Dr. Garnold Mills, of Haverfordwest.

Deaths

ALEXANDER BRUCE KAY, Flying Officer, R.A.F., who died on July 4, at Mosul, Iraq, as the result of a flying accident, aged 23, was the son of Dr. and Mrs. A. R. Kay, The Manor House, Blakeney, Norfolk.

MAJOR WALTER BROGDIN LAWSON, D.F.C. late 48th Highlanders of Canada, and R A.F., who was killed in a flying accident at Aviation Field, Winnipeg, on June 16, in his 36th year, was the son of the late James F. Lawson, of Ridgemere, Barrie, Ontario.

LIEUT. JOHN NICHOLSON, R.N., who was killed at Malta as the result of a flying accident, was the only son of Major and Mrs. H. Scoble Nicholson, late of South India and Ceylon, and a grand-nephew of Sir Andrew Scoble, P.C. In September last he married Miss Mariel Collen, eldest daughter of Mrs. P. E. Collen, of Abingdon Road, South Kensington.

The Royal Air Force Dinner Club

THE Royal Air Force Dinner Club held its sixth annual dinner at the Connaught Rooms on June 29 last, Air Vice-Marshal, Sir J. F. A. Higgins, K.C.B., K.B.E., D.S.O., A.F.C., presiding. Those present included the following :—

Brig.-Gen. J. H. W. Becke, Col. T. E. St. C. Daniell, Lt.-Col. R. C. Donaldson-Hudson, Lt.-Col. A. S. W. Dore, Lt.-Col. F. H. L. Errington, Maj. F. C. Baker, Maj. C. G. Beatson, Lt.-Col. T. A. E. Cairnes, Lt.-Col. R. A. Cockburn, Maj. H. G. ffiske, Maj. A. V. Holt, Maj. S. Lambert, Maj. F. S. Moller, Maj. J. M. Pye-Smith, Maj. B. C. Windeler, Capt. H. H. Balfour, Capt. H. T. Pemell, Capt. J. N. S. Stott, Air Vice-Marshal Sir W. S. Brancker, Air Vice-Marshal Sir H. R. M. Brooke-Popham, Air Vice-Marshal Sir P. W. Game, Air Vice-Marshal Sir J. F. A. Higgins, Air Vice-Marshal C. L. Lambe, Air Vice-Marshal C. A. H. Longcroft, Air Vice-Marshal Sir A. V. Vyvyan, Air Commodore J. L. Forbes, Air Commodore F. V. Holt, Air Commodore A. M. Longmore, Group Capt. A. V. Bettington, Group Capt. the Hon. J. D. Boyle, Group Capt. C. S. Burnett, Group Capt. C. L. Courtney, Group Capt. P. F. M. Fellowes, Group Capt. A. Fletcher, Group Capt. G. Laing, Group Capt. P. H. L. Playfair, Group Capt. C. E. H. Rathborne, Group Capt. R. P. Ross, Wing-Com. J. T. Babington, Wing-Com. A. S. Barratt, Wing-Com. H. R. Busteed, Wing-Com. C. L. Colbran, Wing-Com. D. C. S. Evill, Wing-Com. A. G. R. Garrod, Wing.-Com. E. L. Gossage, Wing-Com. C. G. S. Gould, Wing-Com. G. P. Grenfell, Wing-Com. W. J. Y. Guilfoyle, Wing-Com. T. E. B. Howe, Wing-Com. A. W. H. James, Wing-Com. J. N. Macdonald, Wing-Com. C. E. Maude, Wing-Com. R. B. Maycock, Wing-Com. F. L. Robinson, Wing-Com. J. H. S. Tyssen, Wing-Com. W. L. Welsh, Sq.-Ldr. J. O. Andrews, Sq.-Ldr. H. V. Champion de Crespigny, Sq.-Ldr. R. Collishaw, Sq.-Ldr. A. Coningham, Sq.-Ldr. L. T. N. Gould, Sq.-Ldr. J. B. Graham, Sqd.-Ldr. R. Graham, Sq.-Ldr. A. Gray, Sq.-Ldr. R. Halley, Sq.-Ldr. R. F. S. Leslie, Sq.-Ldr. C. W. Mackey, Sq.-Ldr. W. H. Park, Sq.-Ldr. C. A Rea, Sq.-Ldr. M. Thomas, Sq. Ldr. G. G. A. Williams, Sq.-Ldr. F. Workman, Fl.-Lt. J. C. Andrews, Fl.-Lt. B. R. Apps, Fl.-Lt. E. B. C. Betts, Fl. Lt. E. A. Britton, Fl.-Lt. J. Bussey, Fl.-Lt. N. Comper, Fl.-Lt. C. J. S. Dearlove, Fl.-Lt. C. B. Dick-Cleland, Fl.-Lt. A. S. Ellerton, Fl. Lt. T. W. Elmhirst, Fl. Lt. L. E. M. Gillman, Fl.-Lt. W. Halford, Fl.-Lt. L. M. Hilton, Fl.-Lt. L. N. Hollinghurst, Fl.-Lt. J. Lawson, Fl.-Lt. R. S. Martin, Fl.-Lt. J. M. Mason, Fl.-Lt. E. R. Openshaw, Fl.-Lt. H. A. L. Pattison, Fl.-Lt. G. A. H. Pidcock, Fl.Lt. C. H. Potts, Fl.-Lt. G. H. Smith, Fl.-Lt. A. B. Wiggin, Rev. J. Black, Rev. G. S. Ensell, Rev. R. E. V. Hanson, Messrs. D. J. Allardice, G. Saunt-Barfoot, C. E. St. J. Beamish, W. K. Beisiegel, J. F. Blick, J. S. Bradley, C. L. G. Colebrook, E. B. Fielden, N. Fielden, R. J. A. Ford, P. G. A. Harvey, V. T. Harwood, E. McM. Howes, C. E. Hurst, H. A. Jones, R. Mackenzie, T. H. Newsome, T. S. Pearson, T. D. S. Purdey, L. W. Thres, C. G. H. Winter.

IMPORTS AND EXPORTS

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910).

For 1910 and 1911 figures see FLIGHT for January 25, 1912.

For 1912 and 1913, see FLIGHT for January 17, 1914.

For 1914, see FLIGHT for January 15, 1915, and so on yearly, the figures for 1927 being given in FLIGHT, January 19, 1928.

	Imports.		Exports.		Re-Exports.	
	1927.	1928.	1927.	1928.	1927.	1928.
	£	£	£	£	£	£
Jan. ..	1,850	1,220	49,021	157,598	—	330
Feb. ..	679	1,772	63,080	118,622	—	345
Mar. ..	7,087	4,805	106,478	125,901	2,270	1,307
April ..	822	2,904	71,190	134,126	785	3
May ..	1,258	2,513	82,708	118,804	640	640
June ..	1,249	5,916	149,907	86,245	162	1,317
	12,945	19,130	522,384	741,296	3,857	3,942

PUBLICATIONS RECEIVED

U.S. National Advisory Committee for Aeronautics, Technical Notes: *No.* 273.—The Effect on Performance of a Cutaway Centre Section. By T. Carroll. January, 1928. *No.* 274.—The Effect of the Sperry Messenger Fuselage on the Air Flow at the Propeller Plane. By F. E. Weick. January, 1928. *No.* 275.—Determination of Propeller Deflection by Means of Static Load Tests on Models. By F. E. Weick. January, 1928. *No.* 277.—Pressure Distribution on Wing Ribs of the VE-7 and TS Airplanes in Flight; Part II. Pull-ups. By R. V. Rhode. January, 1928. *No.* 278.—An Automatic Speed Control for Wind Tunnels. By A. F. Zahm. February, 1928. *No.* 279.—Resistance of Streamline Wires. By G. L. DeFoe. March, 1928. *No.* 280.—Drag of Exposed Fittings and Surface Irregularities on Airplane Fuselages. By D. H. Wood. March, 1928. *No.* 281.—A Comparison of Propeller and Centrifugal Fans for Circulating the Air in a Wind Tunnel. By F. E. Weick. March, 1928. U.S. National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

Official Aerial Time-Table, Summer, 1928. Schweizerische Luftverkehrs-Union, Kaspar Escher-Haus, Zurich i, Switzerland.

The Air Pilot Monthly Supplement. No. 43. *May*, 1928. Air Ministry, Kingsway, London, W.C.2.

Memories of Land and Sky. By Gertrude Bacon, F.R.A.S. Methuen and Co., Ltd., 36, Essex Street, W.C. Price 7*s*. 6*d*. net.

Particulars of Meteorological Reports issued by Wireless Telegraphy in Great Britain and the Countries of Europe and North Africa. 1928. Meteorological Office, Air Ministry. M.O. 252. H.M. Stationery Office, Kingsway, London, W.C.2. Price 4*s*. net.

Specialloid Gazette. Vol. I. No. 6. *March*, 1928. Specialloid, Ltd., Friern Park, North Finchley, London, N.12.

Catalogue

"Eagle" Aircraft Cameras and Equipment. Williamson Manufacturing Co., Ltd., Litchfield Gardens, Willesden Green, London, N.W.10.

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